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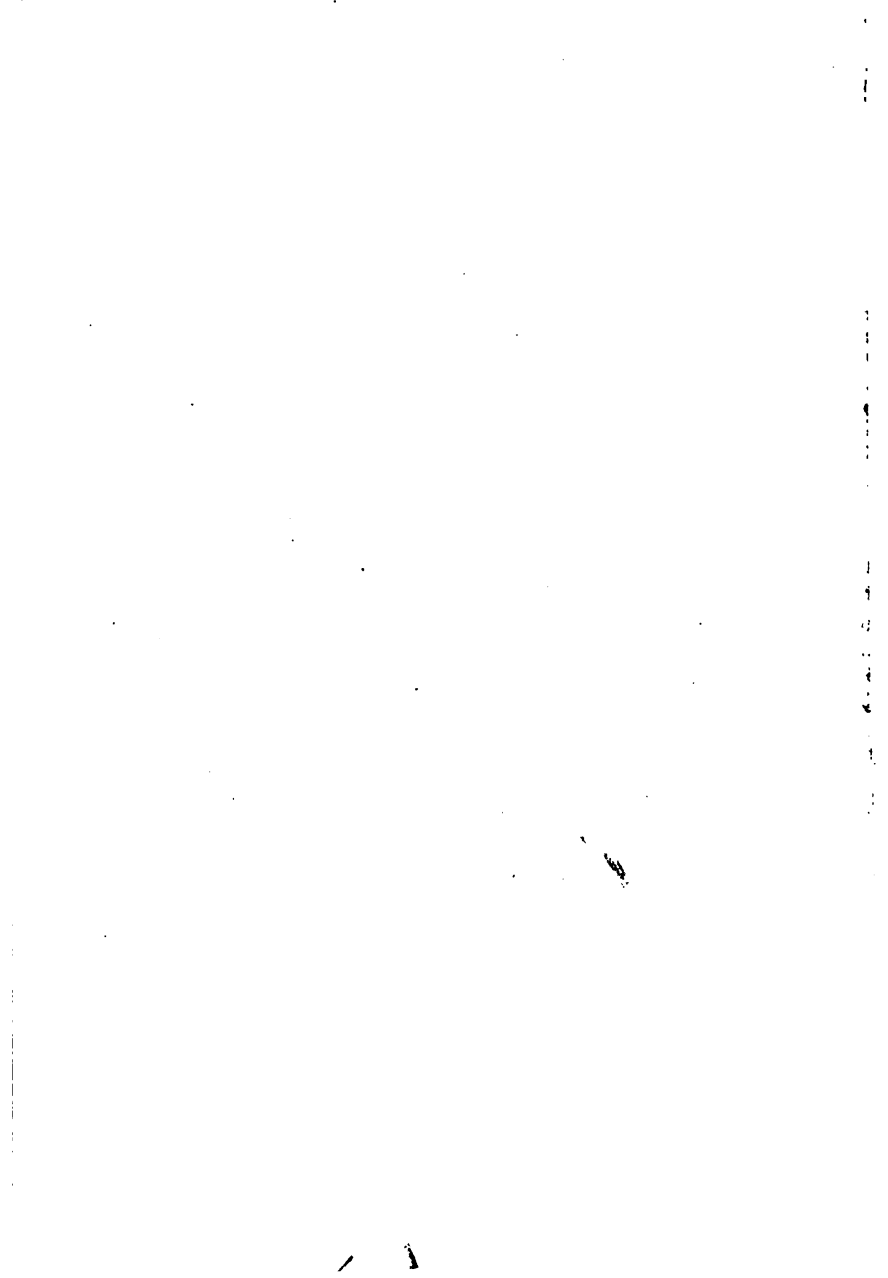
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ORAL ARITHMETIC

BY GRADES

BOOK TWO

DESIGNED FOR THE USE OF CLASSES IN THE FIFTH,
SIXTH, AND SEVENTH YEARS OF THE
PUBLIC SCHOOL COURSE

BY

ALFRED KIRK

AND

A. R. SABIN

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OR. AR. TWO.

E-P 34

PREFACE.

A CELEBRATED French philosopher gave utterance to the following as summing up the requirements for successful living: "A man," said he, "should know, first, where he is; second, where he is going; and third, how to get there." A like suggestive principle applies to all effort towards mathematical acquisition. It is the movement from the known to the unknown, by means of the relations subsisting between them, which constitutes always and at all times intelligent action.

It is the special distinction of Oral Arithmetic, that, in its application, the pupil moves by an irresistible momentum of logic to a rational judgment, whether the burden of proof be one of *reductio ad absurdum*, or whether it be along direct lines of demonstration. In the solution of arithmetical problems, this principle appeals for constant recognition, if the pupil would gain that intellectual power which, under the direction of a trained mind, will enable him to discuss intelligently the various problems that are pressing him at every period of his life. The various phases of arithmetical study are herein set forth in problems of every grade and variety, to be solved as all problems should be by the means of

the conations attached. As no two social problems are exactly alike, so no two mathematical problems are limited by identical conditions. Hence it is, that the solution of each problem is a thing of itself. Yet there are great underlying principles which pervade and dominate them all, and to these principles we must ever appeal in our discussions. Attention is directed to the following two of them: 1st. Given two quantities, to find the relations which one of them sustains to the other; and 2d. Given one of two quantities, and the relation which one of them sustains to the other, to find the other. On these two principles hang all the law and the prophecy of Arithmetic.

FIFTH GRADE.



FIFTH GRADE.

LESSON I.

1. Recite the multiples of 2 to 60.

SUGGESTION. — The multiples of 2 are 4, 6, 8, 10, 12, etc.

2. How many 2's in 18? What are the factors of 18?
Of 24? Of 26? Of 50?

3. Recite the multiples of 3 to 60. How many 3's in 18? What are the factors of 18? 21? 33? 39?

4. What multiples of 3 to 60 are also multiples of 2?

5. Recite the multiples of 4 to 60.

6. What are the factors of 28? Of 36? Of 44?

7. What multiples of 4 to 60 are also multiples of 3?
Of 2? Explain why they are.

8. What multiples have 4, 3, and 2 in common to 60?

9. Recite the multiples of 5 to 60.

10. What are the factors of 15? Of 25? Of 35?

11. What multiples has 5 in common with 4? With 3?
With 2? What multiple is common to all?

NOTE. — Let it be observed that these multiples are aggregations of 2's, 3's, 4's, and 5's, and may be resolved into factors. They are *composite numbers*. Let it be further observed that numbers like 1, 2, 3, 5, 7, 11, 13, etc., are aggregations of 1's, and 1's only, and are therefore called *prime numbers*. *Prime factors are prime numbers*.

12. Name the prime factors of 4. Of 6. Of 9. Of 15.
Of 21. Of 25. Of 33. Of 35. Of 49. Of 121.

13. Name the two equal factors of 4. Of 144. Of 400.

14. Name the prime factors of 8. Of 12. Of 16.

SUGGESTION. — $8 = 2 \times 2 \times 2$; $12 = 2 \times 2 \times 3$, etc.

15. Name the prime factors of 27. Of 32. Of 64.

LESSON II.

1. Recite the multiples of 6 to 84.
2. What number is a common divisor of these multiples?
3. What factor, or factors, are common to 42 and 54?
4. What is the largest divisor common to 42 and 54?
5. What factors are common to 36 and 48?
6. What is the greatest common divisor (G. C. D.) of 36 and 48?
7. Recite the multiples of 7 to 84.
8. What is the G. C. D. of these multiples?
9. What is the G. C. D. of 21 and 42? Of 42 and 63? Of 14 and 35?
10. Recite the multiples of 9 to 108. The multiples of 8.
11. What is the greatest common divisor of 18 and 27? Of 18 and 45? Of 36 and 81? Of 36 and 72?
12. Of what numbers between 50 and 144 is 11 the greatest common divisor?
13. Of what numbers less than 100 is 15 the greatest common divisor?

Name the G. C. D. of the following:

14. 27 and 30. 36 and 40. 55 and 60. 18 and 24.
15. 42 and 49. 48 and 56. 54 and 63. 70 and 80.
16. 77 and 88. 26 and 39. 22 and 88. 9 and 24.
17. What kind of numbers is divisible by 2? What numbers below 100 are divisible by 3? By 5? By 9?
18. What is the least multiple common to 3 and 4? To 4 and 5? To 2 and 5? To 3 and 7?
19. What is the least common multiple (L. C. M.) of 5 and 7? Of 8 and 9? Of 5 and 11? Of 7 and 10?
20. What is the L. C. M. of 4 and 6? Of 6 and 8? Of 8 and 10? Of 16 and 20? Of 12 and 16? Of 8 and 12? Of 16 and 24? Of 25 and 30?

LESSON III.

1. Name the L. C. M. of 2, 3, and 4. Of 2, 3, and 5. Of 3, 4, and 5. Of 2, 4, and 6. Of 4, 6, and 8. Of 3, 6, and 9.

2. Name the L. C. M. of 5, 10, and 15. Of 6, 8, and 12. Of 2, 7, and 14. Of 2, 3, and 7. Of 2, 4, and 7. Of 2, 5, and 7. Of 2, 6, and 7. Of 2, 6, and 8.

3. Name the L. C. M. of 3, 12, and 15. Of 3, 10, and 12. Of 3, 10, and 15.

4. Name the L. C. M. of 5, 15, and 18. Of 6, 9, and 12. Of 18 and 24.

5. Name the L. C. M. of 2, 3, 4, 6, 8, 9, and 12.

SUGGESTION. — Let it be observed that 8 and 9 are prime to each other, and that nothing less than their product can be the L. C. M.

6. The L. C. M. of 2, 3, 4, 6, and 9 = 4×9 . Why?

7. The L. C. M. of 2, 3, 5, and 15 = 2×15 . Why?

8. The L. C. M. of 6, 9, 24, and 40 = 9×40 . Why?

9. The L. C. M. of 3 and 7 is 21. Why?

10. The L. C. M. of 12 and 15 = 4×15 . Why?

11. The L. C. M. of 4, 8, 12, and 16 = 16×3 . Why?

12. The L. C. M. of 15, 20, and 25 = $25 \times 4 \times 3$. Why?

13. The L. C. M. of 15, 18, and 24 = $24 \times 5 \times 3$. Why?

14. The L. C. M. of 12 and 15 = 20×3 . Why?

SUGGESTION. — The relation of 12 to 15 is the relation of 4 to 5. The multiple of 4 and 5 is 20. 3 times 20 is the multiple of 3 times 4 and 3 times 5.

15. The L. C. M. of 28 and 32 = 56×4 . Why?

Find the L. C. M. of the following:

16. 18 and 21. 21 and 24. 24 and 27. 27 and 30.

17. 30 and 33. 33 and 36. 16 and 20. 24 and 28.

18. 35 and 40. 45 and 50. 55 and 60. 24 and 30.

19. 36 and 42. 48 and 54. 21 and 28. 35 and 42.

LESSON IV.

1. What is the value of $\frac{3}{4}$?

ANALYSIS. — The value of $\frac{3}{4}$ is *three* of the *four* equal parts of a thing or quantity.

2. What is the value in cents of \$ $\frac{3}{4}$?
3. How many quarts of milk are $\frac{3}{4}$ of a gallon?
4. How many inches are $\frac{3}{4}$ of a foot?
5. How many quarts of oats are $\frac{3}{4}$ of a peck?
6. How many hours are $\frac{3}{4}$ of a day?
7. How many minutes are $\frac{3}{4}$ of an hour?
8. What is meant by $\frac{2}{3}$? By $\frac{2}{3}$ of an orange?
9. When a thing, or quantity, is divided into two equal parts, what are the parts called?
10. What is $\frac{1}{2}$ of a dime? Of \$1? Of any quantity?
11. When a thing, or quantity, is divided into three equal parts, what are the parts called?
12. What is $\frac{1}{3}$ of a yard expressed in inches?
13. By means of inches compare $\frac{1}{3}$ of a yard with $\frac{1}{2}$ of a yard. $\frac{1}{2}$ of a yard with $\frac{2}{3}$ of a yard.
14. When a thing, or quantity, is divided into four equal parts, what are the parts called?
15. What is $\frac{1}{4}$ of a yard expressed in inches? $\frac{2}{4}$ of a yard? $\frac{3}{4}$ of a yard?
16. By means of inches compare $\frac{1}{4}$ of a yard with $\frac{1}{3}$ of a yard. $\frac{3}{4}$ of a yard with $\frac{2}{3}$ of a yard.
17. How many \$ $\frac{1}{4}$ are there in a dollar? How many \$ $\frac{1}{4}$ are there in a half-dollar?
18. When a thing, or quantity, is divided into five equal parts, what are the parts called?
19. What is $\frac{1}{5}$ of 100 cents? $\frac{2}{5}$ of 100 cents? $\frac{3}{5}$ of 100 cents? $\frac{4}{5}$ of 100 cents?
20. How many fifths of a thing are less than $\frac{1}{2}$ of the same thing? How many fifths are more than $\frac{1}{2}$?

LESSON V.

1. When a thing, or quantity, is divided into six equal parts, what are the parts called?

2. How many cents are $\frac{1}{6}$ of 100 cents? $\frac{2}{6}$ of 100 cents? $\frac{3}{6}$ of 100 cents? $\frac{4}{6}$ of 100 cents? $\frac{5}{6}$ of 100 cents?

3. Compare $\$ \frac{2}{6}$ with $\$ \frac{1}{3}$. $\$ \frac{4}{6}$ with $\$ \frac{2}{3}$. $\$ \frac{5}{6}$ with $\$ \frac{1}{2}$.

4. Compare $\$ \frac{5}{6}$ with $\$ \frac{2}{3}$. $\$ \frac{5}{6}$ with $\$ \frac{4}{6}$.

5. When a thing, or quantity, is divided into seven equal parts, what are the parts called?

6. How many days are $\frac{1}{7}$ of 4 weeks? $\frac{2}{7}$ of 4 weeks? $\frac{3}{7}$ of 8 weeks? $\frac{4}{7}$ of 8 weeks? $\frac{5}{7}$ of 6 weeks? $\frac{6}{7}$ of 6 weeks?

7. What number of sevenths are less than half of a quantity? What number of sevenths are more than half of a quantity?

8. When a thing, or quantity, is divided into eight equal parts, what are the parts called?

9. How many cents are $\$ \frac{1}{8}$? $\$ \frac{2}{8}$? $\$ \frac{3}{8}$? $\$ \frac{4}{8}$? $\$ \frac{5}{8}$? $\$ \frac{6}{8}$? $\$ \frac{7}{8}$?

10. Compare $\$ \frac{3}{8}$ with $\$ \frac{2}{8}$. $\$ \frac{5}{8}$ with $\$ \frac{3}{8}$. $\$ \frac{6}{8}$ with $\$ \frac{3}{4}$. $\$ \frac{7}{8}$ with $\$ \frac{4}{8}$.

11. When a thing, or quantity, is divided into ten equal parts, what are the parts called?

12. What is $\frac{1}{10}$ of \$100? $\frac{2}{10}$ of \$5? $\frac{3}{10}$ of \$6? $\frac{4}{10}$ of \$25? $\frac{5}{10}$ of \$50? $\frac{6}{10}$ of \$75? $\frac{7}{10}$ of \$30? $\frac{8}{10}$ of one dime? $\frac{9}{10}$ of \$10?

13. When a thing, or quantity, is divided into twelve equal parts, what are the parts called?

14. What is $\frac{1}{12}$ of 144 sq. in.? $\frac{2}{12}$? $\frac{3}{12}$? $\frac{4}{12}$? $\frac{5}{12}$? $\frac{6}{12}$? $\frac{7}{12}$? $\frac{8}{12}$? $\frac{9}{12}$? $\frac{10}{12}$? $\frac{11}{12}$?

15. Compare $\frac{1}{12}$ of a day with $\frac{1}{6}$ of a day. $\frac{2}{12}$ of a foot with $\frac{1}{4}$ of a foot. $\frac{4}{12}$ of a dozen with $\frac{1}{3}$ of a dozen. $\$ \frac{8}{12}$ with $\$ \frac{2}{3}$. $\$ \frac{9}{12}$ with $\$ \frac{3}{4}$.

LESSON VI.

1. What is the value in integers of $\frac{1}{4}$?

ANALYSIS.—In 1, there are $\frac{1}{4}$. In $\frac{1}{4}$, there are as many 1's as there are 4's in 12.

2. What is the value in integers of $\frac{1}{2}$? $\frac{1}{3}$? $\frac{3}{4}$? $\frac{3}{5}$? $\frac{4}{6}$? $\frac{5}{7}$? $\frac{2}{8}$? $\frac{7}{9}$? $\frac{11}{10}$? $\frac{11}{11}$? $\frac{13}{12}$?

3. Change to integers or to mixed numbers: $\frac{2}{2}$; $\frac{2}{3}$; $\frac{2}{4}$; $\frac{2}{5}$; $\frac{2}{6}$; $\frac{2}{7}$; $\frac{2}{8}$; $\frac{2}{9}$; $\frac{2}{10}$; $\frac{2}{11}$; $\frac{2}{12}$.

4. Give integral or mixed values of: $\frac{2}{7}$; $\frac{7}{2}$; $\frac{11}{2}$; $\frac{11}{11}$; $\frac{5}{8}$; $\frac{8}{5}$; $\frac{5}{7}$; $\frac{7}{5}$.

5. How many sevenths are there in 8?

ANALYSIS.—In 1 there are $\frac{1}{7}$. In 8 there are 8 times $\frac{1}{7}$, or $\frac{8}{7}$.

6. How many fifths are there in 6? In $6\frac{1}{5}$? In $7\frac{2}{5}$? In $8\frac{3}{5}$? In $9\frac{4}{5}$? In $10\frac{5}{5}$?

7. How many thirds are there in $4\frac{1}{3}$? In $5\frac{2}{3}$? In $3\frac{1}{3}$? In $33\frac{1}{3}$? In $66\frac{2}{3}$? In $83\frac{1}{3}$?

8. Change to improper fractions: $6\frac{1}{4}$; $8\frac{1}{4}$; $16\frac{3}{4}$; $12\frac{1}{2}$; $37\frac{1}{2}$; $87\frac{1}{2}$.

9. In $\frac{1}{5}$ of a week, how many weeks?

10. In $\frac{2}{4}$ of a peck, how many pecks?

11. In $\frac{1}{11}$ of a pound, how many pounds?

12. In $\$5\frac{1}{2}$, how many half-dollars?

13. In $\$3\frac{5}{8}$, how many eighths of a dollar?

14. In $\$3\frac{1}{3}$, how many sixths of a dollar?

15. In $\frac{4}{8}$ of a day, how many days?

16. In $\frac{2}{7}$ of a rod, how many rods?

17. In $20\frac{7}{8}$ weeks, how many ninths of a week?

18. In $12\frac{7}{12}$ years, how many twelfths of a year?

19. In $6\frac{2}{3}$ acres, how many thirds of an acre?

20. In $12\frac{5}{6}$ of a bushel, how many bushels?

21. In $\frac{5}{8}$ of a yard, how many yards?

22. In $\frac{2}{9}$ of an acre, how many acres?

23. In $1\frac{4}{4}$ of a cord, how many cords?

LESSON VII.

1. $\frac{1}{2}$ equals how many 4ths? How many 6ths? How many 8ths? How many 10ths? How many 12ths? How many 16ths?

2. $\frac{1}{3}$ equals how many 6ths? How many 9ths? How many 12ths?

3. $\frac{2}{3}$ equals how many 6ths? How many 9ths? How many 12ths?

4. $\frac{1}{4}$ equals how many 8ths? How many 12ths? How many 16ths?

5. $\frac{3}{4}$ equals how many 8ths? How many 12ths? How many 16ths?

6. $\frac{1}{5}$ equals how many 10ths? How many 15ths? How many 20ths?

7. $\frac{2}{5}$ equals how many 10ths? How many 15ths? How many 20ths?

8. $\frac{3}{5}$ equals how many 10ths? How many 15ths? How many 20ths?

9. $\frac{1}{6}$ equals how many 12ths? How many 18ths? How many 24ths?

10. $\frac{5}{6}$ equals how many 12ths? How many 18ths? How many 24ths?

11. $\frac{1}{8}$ equals how many 16ths? How many 24ths? How many 32ds?

12. $\frac{3}{8}$ equals how many 16ths? How many 24ths? How many 32ds?

13. Change $6\frac{1}{4}$ to 16ths. $8\frac{1}{8}$ to 12ths. $12\frac{1}{2}$ to 8ths. $16\frac{3}{8}$ to 6ths. $33\frac{1}{2}$ to 12ths. $6\frac{3}{8}$ to 10ths.

14. Change to 12ths: $\frac{1}{2}$; $\frac{1}{3}$; $\frac{2}{3}$; $\frac{1}{4}$; $\frac{3}{4}$; $\frac{1}{6}$; $\frac{5}{6}$.

15. Change to 16ths: $\frac{3}{4}$; $\frac{5}{8}$; $\frac{3}{8}$; $\frac{5}{16}$; $3\frac{1}{4}$; $3\frac{3}{8}$; $6\frac{1}{4}$.

16. Change to 18ths: $\frac{3}{4}$; $\frac{2}{3}$; $\frac{1}{6}$; $\frac{5}{9}$; $\frac{2}{9}$; $\frac{5}{18}$.

17. Change to 24ths: $5\frac{1}{2}$; $3\frac{1}{3}$; $5\frac{1}{4}$; $1\frac{1}{6}$; $3\frac{1}{8}$; $3\frac{1}{12}$.

18. Change to 32ds: $\frac{3}{4}$; $\frac{1}{4}$; $\frac{3}{8}$; $\frac{3}{16}$; $\frac{5}{8}$; $\frac{1}{2}$; $\frac{7}{16}$.

LESSON VIII.

Find the sum of:

- | | | | |
|--------------------------------------|---------------------------------------|---------------------------------------|---|
| 1. $\frac{1}{2}$ and $\frac{1}{3}$. | 6. $\frac{1}{4}$ and $\frac{1}{5}$. | 11. $\frac{1}{5}$ and $\frac{1}{6}$. | 16. $\frac{3}{4}$ and $\frac{5}{8}$. |
| 2. $\frac{1}{2}$ and $\frac{2}{3}$. | 7. $\frac{1}{4}$ and $\frac{2}{5}$. | 12. $\frac{2}{5}$ and $\frac{2}{6}$. | 17. $\frac{7}{8}$ and $\frac{5}{12}$. |
| 3. $\frac{1}{3}$ and $\frac{1}{4}$. | 8. $\frac{3}{4}$ and $\frac{3}{5}$. | 13. $\frac{3}{5}$ and $\frac{5}{8}$. | 18. $\frac{3}{10}$ and $\frac{4}{15}$. |
| 4. $\frac{2}{3}$ and $\frac{1}{4}$. | 9. $\frac{1}{3}$ and $\frac{4}{5}$. | 14. $\frac{4}{5}$ and $\frac{3}{4}$. | 19. $\frac{1}{3}$ and $\frac{1}{5}$. |
| 5. $\frac{2}{3}$ and $\frac{3}{4}$. | 10. $\frac{3}{4}$ and $\frac{3}{5}$. | 15. $\frac{4}{5}$ and $\frac{3}{4}$. | 20. $\frac{3}{10}$ and $\frac{3}{12}$. |

21. Add by $2\frac{1}{2}$ from 0 to 50. By $3\frac{1}{3}$ from 0 to 50.22. Add by $6\frac{1}{4}$ from 0 to 100. By $8\frac{1}{3}$ from 0 to 100.23. Add by $12\frac{1}{2}$ from 0 to 100. By $16\frac{2}{3}$ from 0 to 100.24. A boy spent $\$ \frac{2}{3}$ for a book, and $\$ \frac{1}{4}$ for a knife.

How much did he spend for both?

25. James rode $\frac{3}{4}$ of a mile and walked $\frac{1}{4}$ of a mile.

How far did he go?

26. How much land is $\frac{1}{3}$ of an acre and $\frac{2}{3}$ of an acre?27. How much cloth is $2\frac{1}{2}$ yards and $3\frac{1}{3}$ yards?28. How many pecks are $3\frac{1}{3}$ pecks and $\frac{2}{3}$ of a peck?29. A farmer sold $\frac{1}{3}$ of his corn at one time and $\frac{2}{3}$ of it at another. What part of his corn did he sell?30. A miller, owning $\frac{3}{10}$ of a mill, bought $\frac{3}{8}$ more of it.

What part of the mill did he then own?

31. What is the sum of $8\frac{3}{10}$ hours and $9\frac{5}{12}$ hours?32. How many tons are $4\frac{3}{10}$ tons and $6\frac{3}{8}$ tons?33. How many acres are $6\frac{3}{8}$ acres and $7\frac{7}{12}$ acres?34. How many barrels are $3\frac{3}{4}$ bbl. and $4\frac{1}{2}$ bbl.?35. How many pounds are $4\frac{3}{8}$ lb. and $5\frac{1}{3}$ lb.?36. How many inches are $4\frac{1}{8}$ in., $2\frac{1}{4}$ in., and $5\frac{1}{2}$ in.?37. How many weeks are $7\frac{3}{4}$ and $5\frac{1}{2}$ weeks?38. How many months are $4\frac{3}{4}$ and $5\frac{5}{8}$ months?39. How many gallons are $6\frac{3}{8}$ and $9\frac{3}{8}$ gal.?40. How many yards are $4\frac{1}{5}$ yd., $7\frac{1}{5}$ yd., and $5\frac{3}{5}$ yd.?41. How many rods are 5 times $\frac{3}{4}$ rd. and 6 times $\frac{3}{8}$ rd.?42. What is the sum of $\$ \frac{2}{3}$, $\$ \frac{1}{4}$, and $\$ \frac{3}{12}$?

LESSON IX.

1. $\$ \frac{3}{10}$ and how many tenths of a dollar equal \$1?
2. $\frac{5}{12}$ of a foot and how many twelfths of a foot equal one foot?
3. $\frac{3}{8}$ of a peck and how many eighths of a peck equal one peck?
4. $\$ \frac{2}{3}$ and how many thirds of a dollars equal \$3?
5. $3\frac{1}{2}$ dozen and how many dozen are 10 dozen?
6. $6\frac{1}{4}$ inches and how many inches make one foot?
7. $3\frac{2}{3}$ feet and how many feet equal 2 yards?
8. $5\frac{2}{3}$ and how many equal 11?
9. $3\frac{5}{8}$ and how many equal 13?
10. What number added to $4\frac{5}{8}$ equals 14?

What is the value of:

- | | | |
|--|---|--|
| 11. $\frac{1}{2}$ less $\frac{1}{8}$? | 21. $\frac{2}{3}$ less $\frac{1}{2}$? | 31. $\frac{5}{8}$ less $\frac{2}{4}$? |
| 12. $\frac{1}{3}$ less $\frac{1}{4}$? | 22. $\frac{3}{4}$ less $\frac{2}{8}$? | 32. $\frac{5}{8}$ less $\frac{3}{8}$? |
| 13. $\frac{1}{4}$ less $\frac{1}{8}$? | 23. $\frac{4}{5}$ less $\frac{2}{5}$? | 33. $\frac{7}{8}$ less $\frac{5}{10}$? |
| 14. $\frac{1}{6}$ less $\frac{1}{6}$? | 24. $\frac{4}{5}$ less $\frac{3}{4}$? | 34. $\frac{5}{8}$ less $\frac{5}{12}$? |
| 15. $\frac{1}{6}$ less $\frac{1}{7}$? | 25. $\frac{5}{8}$ less $\frac{4}{5}$? | 35. $\frac{3}{8}$ less $\frac{3}{12}$? |
| 16. $\frac{1}{7}$ less $\frac{1}{8}$? | 26. $\frac{4}{5}$ less $\frac{2}{6}$? | 36. $\frac{4}{12}$ less $\frac{4}{15}$? |
| 17. $\frac{1}{8}$ less $\frac{1}{9}$? | 27. $\frac{3}{8}$ less $\frac{1}{5}$? | 37. $\frac{7}{12}$ less $\frac{3}{16}$? |
| 18. $\frac{1}{9}$ less $\frac{1}{10}$? | 28. $\frac{3}{5}$ less $\frac{3}{8}$? | 38. $\frac{8}{12}$ less $\frac{4}{16}$? |
| 19. $\frac{1}{10}$ less $\frac{1}{11}$? | 29. $\frac{4}{9}$ less $\frac{4}{10}$? | 39. $\frac{4}{6}$ less $\frac{4}{9}$? |
| 20. $\frac{1}{11}$ less $\frac{1}{12}$? | 30. $\frac{7}{8}$ less $\frac{7}{11}$? | 40. $\frac{5}{8}$ less $\frac{5}{12}$? |

41. If $\frac{1}{3}$ and $\frac{1}{6}$ of a property is sold, what part remains unsold?

42. If you spend $\frac{1}{3}$ and $\frac{1}{2}$ of your money, what part remains?

43. If $\frac{3}{8}$ of a stock of carpets was damaged by fire, and $\frac{3}{8}$ by water, what part of the stock remained uninjured?

44. From $\frac{3}{4}$ bbl. of flour, $\frac{1}{8}$ bbl. was sold. What part of a barrel remained?

LESSON X.

1. How much is 3 times $\$ \frac{1}{4}$?
2. What is 4 times $\frac{1}{2}$ of a ton of coal?
3. How many feet are 2 times $\frac{2}{3}$ of a foot?
4. How many yards are 5 times $\frac{2}{3}$ of a yard?
5. How many feet are 6 times $\frac{2}{3}$ of a yard?
6. How many pecks are 8 times $\frac{3}{4}$ of a bushel?
7. What is the cost of 3 yards of cloth at $\$ \frac{2}{3}$ a yard?
8. What is the cost of 5 yards at $\$ \frac{2}{3}$ a yard?
9. What is the cost of 8 yards at $\$ \frac{2}{3}$ a yard?
10. What is the cost of 12 yards of silk at $\$ \frac{7}{8}$ a yard?
11. What is the cost of 20 bu. of wheat at $\$ \frac{2}{3}$ a bushel?
12. What is the cost of 4 lb. of tea at $\$ \frac{5}{8}$ a pound?
13. What is the cost of 6 bu. of oats at $\$ \frac{2}{3}$ a bushel?
14. At $\$.06\frac{1}{4}$ a quart, what is the price per gallon for milk?
15. At $\$.08\frac{1}{8}$ a doz., what is the cost of 12 doz. eggs?
16. At $\$.16\frac{2}{3}$ a doz., what is the cost of 6 doz. eggs?
17. How many tons of hay in 5 loads of $\frac{2}{3}$ of a ton each?
18. If a team hauls a third more than a ton at a load, how many tons of coal can be delivered in 6 loads?
19. If a vest can be made from $\frac{5}{8}$ of a yard of cloth, how many yards will be required for 8 vests?
20. If a building lot contains $\frac{3}{8}$ of an acre, how many acres will 10 such lots cover?
21. A vessel holding $3\frac{1}{2}$ gallons was emptied 9 times into a barrel. What was the capacity of the barrel in gallons?
22. How many rods of fence can a man build in 6 days, if he builds $\frac{1}{8}$ of a rod in a day?
23. If a laborer earns $\$2\frac{3}{4}$ a day, how much does he earn in 12 days?
24. If 9 men can do a piece of work in $8\frac{1}{8}$ days, in how many days should one man be able to do it?

LESSON XI.

1. How many times $\frac{2}{3}$ are $\frac{6}{3}$? $\frac{8}{3}$? $\frac{12}{3}$? $\frac{16}{3}$?
2. How many times $\frac{3}{4}$ are $\frac{12}{4}$? $\frac{18}{4}$? $\frac{24}{4}$? $\frac{36}{4}$?
3. At $\$ \frac{2}{5}$ for one, how many pineapples can be bought for $\$ \frac{8}{5}$? For $\$ \frac{14}{5}$? For $\$ \frac{22}{5}$? For $\$ \frac{48}{5}$?
4. At $\$ \frac{3}{4}$ a gallon for maple syrup, how many gallons would cost $\$ 6 \frac{3}{4}$?
5. At $\$ \frac{8}{9}$ a bushel, how many bushels of oats can be bought for $\$ 4 \frac{8}{9}$?
6. At $\$ \frac{5}{6}$ a yard, how many yards of linen can you buy for $\$ 6 \frac{7}{6}$?
7. At $\$ \frac{7}{8}$ a bushel, how many bushels of wheat cost $\$ 7 \frac{7}{8}$?
8. At $\$ \frac{3}{4}$ a yard, how many yards of ribbon will $\$ 6$ buy?
9. If a boy can earn $\$ \frac{3}{5}$ a day, how long will it take him to earn $\$ 6$?
10. How long will $\$ 10$ last a man who spends $\$ \frac{2}{3}$ a day?
11. At $\$ \frac{3}{8}$ a peck, how many bushels of apples can you buy for $\$ 9$?
12. At $\$ \frac{1}{8}$ a pound, how many pounds of butter will $\$ 9$ buy?
13. How long will 9 bushels of oats feed a horse that eats $\frac{7}{9}$ of a bushel a day?
14. How many bushels of oats, worth $\$ \frac{3}{4}$ a bushel, will pay for $\frac{2}{3}$ of a barrel of flour, worth $\$ 9$ a barrel?
15. If $\frac{3}{4}$ of a yard of cloth costs $\$ 1$, how much must be paid for $5 \frac{1}{4}$ yds.?
16. In $5 \frac{5}{8}$ acres of land, how many building lots are there of $\frac{3}{8}$ of an acre each?
17. How many $\frac{8}{9}$ are $\frac{24}{9}$? $\frac{40}{9}$? $\frac{56}{9}$? $\frac{72}{9}$?
18. How many $\frac{11}{12}$ are $\frac{44}{12}$? $\frac{66}{12}$? $\frac{88}{12}$? $\frac{121}{12}$?
19. How many $\frac{9}{7}$ are $\frac{63}{7}$? $\frac{132}{7}$? $\frac{54}{7}$?

LESSON XII.

Compare values:

- | | |
|---|---|
| 1. $\frac{1}{2}$ ft. with .5 ft. | 14. $\frac{1}{4}$ yd. with $.33\frac{1}{3}$ yd. |
| 2. $\frac{1}{3}$ hr. with .2 hr. | 15. $\frac{2}{3}$ yd. with $.66\frac{2}{3}$ yd. |
| 3. $\frac{2}{3}$ hr. with .4 hr. | 16. $\$ \frac{1}{3}$ with $\$.12\frac{1}{2}$. |
| 4. $\frac{3}{4}$ hr. with .6 hr. | 17. $\$ \frac{2}{3}$ with $\$.25$. |
| 5. $\frac{4}{5}$ hr. with .8 hr. | 18. $\$ \frac{3}{4}$ with $\$.37\frac{1}{2}$. |
| 6. $\frac{1}{4}$ gal. with .25 gal. | 19. $\$ \frac{5}{8}$ with $\$.50$. |
| 7. $\frac{2}{4}$ gal. with .50 gal. | 20. $\$ \frac{6}{8}$ with $\$.62\frac{1}{2}$. |
| 8. $\frac{3}{4}$ gal. with .75 gal. | 21. $\$ \frac{7}{8}$ with $\$.75$. |
| 9. $\frac{1}{2}$ doz. with $.16\frac{2}{3}$ doz. | 22. $\$ \frac{7}{8}$ with $\$.87\frac{1}{2}$. |
| 10. $\frac{2}{3}$ doz. with $.33\frac{1}{3}$ doz. | 23. $\$ \frac{1}{2}$ with $\$.08\frac{1}{2}$. |
| 11. $\frac{3}{4}$ doz. with .50 doz. | 24. $\$ \frac{5}{12}$ with $\$.41\frac{2}{3}$. |
| 12. $\frac{4}{5}$ doz. with $.66\frac{2}{3}$ doz. | 25. $\$ \frac{7}{12}$ with $\$.58\frac{1}{3}$. |
| 13. $\frac{5}{8}$ doz. with $.83\frac{1}{3}$ doz. | 26. $\$ \frac{9}{12}$ with $\$.83\frac{1}{3}$. |

27. How many quarts are there in .5 of a gallon of milk?

28. How many pounds are .2 of a ton of coal?
29. How many pounds are .4 of 100 lb. of flour?
30. How many minutes are .6 of an hour?
31. How many seconds are .8 of a minute?
32. How many hours are .25 of a day?
33. How many inches are .50 of a foot?
34. How many eggs are .75 of 2 doz. eggs?
35. How many inches are $.16\frac{2}{3}$ of 2 yards?
36. How many half-dollars are $.33\frac{1}{3}$ of \$9?
37. $.66\frac{2}{3}$ of 15 bu. of wheat is how many pecks?
38. $.12\frac{1}{2}$ of a bushel is how many quarts?
39. $.37\frac{1}{2}$ of a bushel is how many quarts?
40. How many pints are $.62\frac{1}{2}$ of 16 quarts?
41. How many hours are $.87\frac{1}{2}$ of a day?
42. How many eggs are $.08\frac{1}{2}$ of 2 doz. eggs?

LESSON XIII.

1. How many integers do .8, .5, and .7 equal?
2. What is the value in integers of .6, .4, .7, and .3?
3. What is the sum of $.12\frac{1}{2}$ and $.87\frac{1}{2}$?
4. What is the sum of $.33\frac{1}{3}$ and $.66\frac{2}{3}$?
5. What is the sum of $.12\frac{1}{2}$ and $.37\frac{1}{2}$?
6. What is the sum of $.37\frac{1}{2}$ and $.62\frac{1}{2}$?
7. What is the sum of $.16\frac{2}{3}$ and $.33\frac{1}{3}$?
8. What part of an orange is $.33\frac{1}{3}$ of an orange less $\frac{1}{6}$ of it?
9. What part of an orange is $.62\frac{1}{2}$ less $.37\frac{1}{2}$ of it?
10. What part of an orange is .9 less .15 of it?
11. What part of any quantity is $.62\frac{1}{2}$ less $.12\frac{1}{2}$ of it?
12. What part of any quantity is $.66\frac{2}{3}$ less $.16\frac{2}{3}$ of it?
13. What part of any quantity is .25 less $.12\frac{1}{2}$ of it?
14. In .8 and .4 how many .2? How many .3? How many .6?
15. In .9 and .6 how many .3? How many .5?
16. What is $\frac{1}{2}$ of .8? $\frac{1}{3}$ of .18? $\frac{1}{4}$ of .16?
17. What is $\frac{1}{5}$ of .35? $\frac{1}{6}$ of .42? $\frac{1}{7}$ of .28?
18. $\frac{1}{8}$ of .32? $\frac{1}{9}$ of .63? $\frac{1}{10}$ of .30? $\frac{1}{11}$ of .55?
19. What is the integral value of:

2 times .5?	10 times .4?
3 times $.33\frac{1}{3}$?	8 times .5?
4 times .25?	3 times $.66\frac{2}{3}$?
5 times .2?	8 times .25?
6 times $.16\frac{2}{3}$?	12 times .5?
8 times $.12\frac{1}{2}$?	$12\frac{1}{2}$ times .8?
10 times .1?	20 times .5?
12 times $.8\frac{1}{3}$?	25 times .4?
6 times $.33\frac{1}{3}$?	22 times $.9\frac{1}{11}$?
9 times $.66\frac{2}{3}$?	16 times $.12\frac{1}{2}$?

LESSON XIV.

1. How many gills in $.5$ of a pint? In $.25$ of a pint?
2. How many pints in $.5$ of a quart?
3. How many quarts in $.25$ of a gallon?
4. How many pints in $.12\frac{1}{2}$ of a gallon? In $.25$ of a gallon?
5. How many inches in $.16\frac{2}{3}$ of a foot?
6. How many inches in $.16\frac{2}{3}$ of a yard?
7. How many inches in $.33\frac{1}{3}$ of a yard?
8. How many rods in $.5$ of a mile?
9. How many rods in $.25$ of a mile?
10. How many rods in $.12\frac{1}{2}$ of a mile?
11. Compare in rods $.37\frac{1}{2}$ of a mile with $.62\frac{1}{2}$ of a mile.
12. How many pounds in $.1$ of a ton of coal? In $.3$ of a ton? In $.5$ of a ton? In $.7$ of a ton? In $.9$ of a ton?
13. How many minutes in $.2$ of an hour? In $.4$ of an hour? In $.6$ of an hour? In $.8$ of an hour?
14. What part of an hour is $.33\frac{1}{3}$ of an hour? How many minutes is that?
15. What part of an hour is $.66\frac{2}{3}$ of an hour? How many minutes is that?
16. What part of an hour is $.75$ of an hour? How many minutes is that?
17. If $.12\frac{1}{2}$ of a yard of ribbon costs \$.03, what is the cost of a yard?
18. If $.16\frac{2}{3}$ peck of potatoes costs \$.07, what is the cost of a peck?
19. What is the cost of $.25$ of a ton of coal, at \$6 a ton?
20. $.12\frac{1}{2}$ of 96 is $.33\frac{1}{3}$ of what number?
21. $.37\frac{1}{2}$ of 24 is $.12\frac{1}{2}$ of what number?
22. What is $.16\frac{2}{3}$ of $.6$ of 30 bushels of oats?
23. What is $.11\frac{1}{3}$ of $.25$ of 40 gallons of oil?

LESSON XV.

1. 6 is $\frac{2}{3}$ of what number?

SUGGESTION. — The number is 2 times $\frac{1}{2}$ of 6, or $\frac{2}{3}$ of 6.

2. 6 is $\frac{2}{3}$ of what number?

SUGGESTION. — The number is 3 times $\frac{1}{2}$ of 6, or $\frac{2}{3}$ of 6.

Of what number:

- | | | |
|------------------------------|-------------------------------|-------------------------------|
| 3. Does $12 = \frac{2}{3}$? | 9. Does $28 = \frac{2}{3}$? | 15. Does $72 = \frac{2}{3}$? |
| 4. Does $15 = \frac{2}{3}$? | 10. Does $24 = \frac{2}{3}$? | 16. Does $72 = \frac{2}{3}$? |
| 5. Does $24 = \frac{2}{3}$? | 11. Does $35 = \frac{2}{3}$? | 17. Does $35 = \frac{2}{3}$? |
| 6. Does $14 = \frac{2}{3}$? | 12. Does $42 = \frac{2}{3}$? | 18. Does $18 = \frac{2}{3}$? |
| 7. Does $21 = \frac{2}{3}$? | 13. Does $36 = \frac{2}{3}$? | 19. Does $20 = \frac{2}{3}$? |
| 8. Does $24 = \frac{2}{3}$? | 14. Does $63 = \frac{2}{3}$? | 20. Does $56 = \frac{2}{3}$? |

Find the cost of an article:

- | | |
|--|--|
| 21. If \$.28 is $\frac{2}{3}$ of cost? | 27. If \$.84 is $\frac{2}{3}$ of cost? |
| 22. If \$.48 is $\frac{2}{3}$ of cost? | 28. If \$.63 is $\frac{2}{3}$ of cost? |
| 23. If \$.42 is $\frac{2}{3}$ of cost? | 29. If \$.56 is $\frac{2}{3}$ of cost? |
| 24. If \$.35 is $\frac{2}{3}$ of cost? | 30. If \$.20 is $\frac{2}{3}$ of cost? |
| 25. If \$.45 is $\frac{2}{3}$ of cost? | 31. If \$.36 is $\frac{2}{3}$ of cost? |
| 26. If \$.33 is $\frac{2}{3}$ of cost? | 32. If \$.66 is $\frac{2}{3}$ of cost? |

Find the cost of a quantity of goods:

33. If \$.37 $\frac{1}{2}$ is the cost of $\frac{2}{3}$ of it.
34. If \$.62 $\frac{1}{2}$ is the cost of $\frac{2}{3}$ of it.
35. If \$.75 is the cost of $\frac{2}{3}$ of it.
36. $\frac{2}{3}$ of a quantity of butter is valued at \$6. What is the value of the whole quantity?
37. $\frac{2}{3}$ of a ton of coal is worth \$14. How much is a ton worth?
38. What is the cost of 3 barrels of flour, at the rate of \$6 for $\frac{2}{3}$ of a barrel?
39. What is the cost of 3 $\frac{1}{2}$ barrels of the same flour? Of 4 $\frac{2}{3}$ barrels?

LESSON XVI.

What is the cost:

1. Of 8 yd. of cloth, at $\$ \frac{5}{8}$ a yard?
2. Of 7 yd. of cloth, at $\$ \frac{4}{7}$ a yard?
3. Of 6 yd. of cloth, at $\$ \frac{4}{3}$ a yard?
4. Of 3 yd. of carpet, at $\$ \frac{7}{3}$ a yard?
5. Of 8 yd. of carpet, at $\$ \frac{3}{8}$ a yard?
6. Of 11 yd. of carpet, at $\$ \frac{11}{11}$ a yard?

7. At $\$.12\frac{1}{2}$ a dozen, how many dozen can be bought for \$1?
8. At $\$.16\frac{2}{3}$ a dozen, how many dozen can be bought for \$1?
9. At $\$.08\frac{1}{8}$ a dozen, how many dozen can be bought for \$1?
10. At $\$.06\frac{1}{4}$ for one, how many plates can be bought for \$1?
11. At $\$.33\frac{1}{3}$ for 6 oranges, how many oranges can be bought for \$1?
12. At $\$.12\frac{1}{2}$ for 3 oranges, how many oranges can be bought for \$1?
13. At \$.25 for 7 roses, how many roses can be bought for \$1.25?
14. At $\$ \frac{9}{10}$ a day, how much can a boy earn in 10 days?
15. At \$.75 a day, how much can he earn in 12 days?
16. At $\$.66\frac{2}{3}$ a day, how much can he earn in 9 days?
17. What is the cost of 9 yards of silk, at $\$ \frac{1}{2}$ a yard?
18. If $\frac{7}{8}$ of a barrel of flour is given to each of 12 families, how many barrels will be given in all?
19. How many acres are there in 11 fields of $\frac{1}{4}$ of an acre each?
20. If $\frac{1}{4}$ of an acre is the size of each of 10 town lots, how many acres are there in the 10 lots?

LESSON XVII.

1. A man owning $\frac{1}{2}$ of a mill sold $\frac{1}{3}$ of his share. What part of the mill did he sell? What part did he still own?

ANALYSIS. — $\frac{1}{2} = \frac{3}{6}$. He sold $\frac{1}{3}$ of $\frac{3}{6}$ of the mill, or $\frac{1}{6}$. There remained $\frac{2}{6}$ less $\frac{1}{6}$, or $\frac{1}{6} = \frac{1}{3}$.

2. What is $\frac{1}{4}$ of $\frac{1}{2}$? What is $\frac{1}{2}$ less $\frac{1}{4}$ of $\frac{1}{2}$?

3. A boy having $\$ \frac{3}{4}$ spent $\frac{1}{2}$ of his money. What part of a dollar did he spend? What part of a dollar had he left?

4. What is $\frac{1}{2}$ of $\$ \frac{3}{4}$? What is $\$ \frac{3}{4}$ less $\frac{1}{2}$ of $\$ \frac{3}{4}$?

5. What is the value in cents of $\$ \frac{3}{8}$?

6. A boy having $\$ \frac{3}{4}$ spent $\$.2$. How much money did he then have?

7. A man owning $\frac{2}{3}$ of a farm sold $\frac{1}{3}$ of his share. What part of the farm did he sell? What part did he still own?

8. What is $\frac{1}{3}$ of $\frac{2}{3}$?

SUGGESTION. — Let it be observed that $\frac{1}{3}$ of $\frac{2}{3} = \frac{1}{3}$ of $\frac{1}{3}$.

9. A man owning $\frac{5}{6}$ of a property sold $\frac{1}{2}$ of his share. What part of the property did he then own?

10. What is $\frac{1}{2}$ of $\frac{5}{6}$? What is $\frac{5}{6}$ less $\frac{5}{12}$?

11. A man bought $\frac{1}{2}$ of a ton of coal, and later $\frac{1}{3}$ of a ton. How much coal did he buy?

12. A man bought $\frac{1}{2}$ of a ton of coal, and later $\frac{1}{3}$ as much more. How much coal did he buy?

What fraction is:

13.

$\frac{1}{2}$ of $\frac{1}{3}$?

$\frac{1}{2}$ of $\frac{1}{4}$?

$\frac{1}{2}$ of $\frac{2}{3}$?

$\frac{1}{2}$ of $\frac{3}{4}$?

$\frac{1}{2}$ of $\frac{1}{2}$?

$\frac{1}{2}$ of $\frac{2}{5}$?

14.

$\frac{1}{3}$ of $\frac{1}{3}$?

$\frac{1}{3}$ of $\frac{2}{3}$?

$\frac{1}{3}$ of $\frac{1}{4}$?

$\frac{1}{3}$ of $\frac{3}{4}$?

$\frac{1}{3}$ of $\frac{2}{5}$?

$\frac{1}{3}$ of $\frac{2}{3}$?

15.

$\frac{1}{4}$ of $\frac{1}{3}$?

$\frac{1}{5}$ of $\frac{1}{4}$?

$\frac{1}{6}$ of $\frac{2}{3}$?

$\frac{1}{7}$ of $\frac{3}{8}$?

$\frac{1}{8}$ of $\frac{2}{5}$?

$\frac{1}{9}$ of $\frac{1}{4}$?

16.

$\frac{2}{7}$ of $\frac{2}{3}$?

$\frac{3}{8}$ of $\frac{3}{8}$?

$\frac{4}{9}$ of $\frac{4}{9}$?

$\frac{5}{10}$ of $\frac{3}{11}$?

$\frac{6}{11}$ of $\frac{1}{3}$?

$\frac{7}{12}$ of $\frac{2}{3}$?

LESSON XVIII.

1. What is $\frac{1}{4}$ of $\frac{1}{2}$ of an orange? $\frac{1}{4}$ of $\frac{2}{3}$ of an orange?
2. What is $\frac{3}{4}$ of $\frac{2}{3}$ of an orange? $\frac{2}{3}$ of $\frac{3}{4}$ of an orange?
3. At $\$ \frac{2}{3}$ a gallon, what is the cost of $\frac{3}{4}$ of a gallon of syrup?
4. At $\$.75$ a gallon, what will $\frac{3}{4}$ of a gallon cost?
5. A man, owning $\frac{2}{3}$ of a farm, sold $\frac{1}{3}$ of his share to his brother, who owned the rest of the farm. What part of the farm did each then own?
6. A, owning $\frac{2}{3}$ of a mill, sold $\frac{1}{3}$ of his share. What part of the mill did he sell? What part remained in his possession?
7. What is $\frac{3}{4}$ of $3\frac{1}{2}$ tons of hay?
8. What is $\frac{3}{4}$ of $.45$ of a bushel of grain?
9. At $\$2\frac{1}{2}$ a ream, what will $\frac{3}{4}$ of a ream of paper cost?
10. What is the cost of $2\frac{1}{2}$ lb. of tea, at $\$ \frac{2}{3}$ a pound?
11. What is the cost of 4 lb. of fish, at $\$.08\frac{1}{2}$ a pound?
12. What is the cost of $\frac{3}{4}$ yd. of cloth, at $\$1\frac{1}{2}$ a yard?
13. A farmer sold $\frac{1}{2}$ of his farm for $\$600$. At that rate, what is $\frac{1}{2}$ of the remainder worth?
14. A farmer sold $\frac{2}{3}$ of his farm for $\$1200$. At that price, what is $\frac{1}{2}$ of the remaining $\frac{1}{3}$ worth?
15. In selling $\frac{2}{3}$ of $\frac{1}{16}$ of a property, what part of the property is sold?
16. By selling $\frac{2}{3}$ of $\frac{1}{8}$ of a bushel of apples, what part of a bushel is sold?
17. What is $\frac{3}{4}$ of $\frac{1}{2}$ of $\$.16\frac{2}{3}$?
18. A man, owning $\frac{7}{8}$ of a coal mine, sold $\frac{1}{8}$ of his share. What part of the mine did he still own?
19. James had $\$ \frac{2}{3}$, and spent $\frac{1}{3}$ of his money. What part of a dollar had he left?
20. A owned $\frac{1}{2}$ of a ship. He sold $\frac{3}{4}$ of his share to B for $\$2000$. How much was the ship worth?

LESSON XIX.

1. In a school of 56 pupils, $\frac{1}{4}$ were girls. How many boys were there?

2. In another school of 56 pupils, $\frac{3}{8}$ were girls. How many boys were there?

3. In an orchard of 72 trees, $\frac{2}{3}$ bore cherries, $\frac{1}{3}$ bore plums, and the rest bore apples. How many trees were there of each kind?

4. From a hogshead of syrup was sold $\frac{3}{4}$ of the contents. How many gallons of syrup remained?

5. There are 32 boys in a certain school, and $\frac{5}{8}$ of the pupils are girls. How many girls are there?

6. A farmer has his sheep in two pastures. There are $\frac{6}{11}$ of them in one, and 100 sheep in the other. How many sheep had he in both pastures?

7. In an orchard consisting of apple and cherry trees, $\frac{7}{12}$ of the trees bore apples, and 60 bore cherries. How many trees were there in the orchard?

8. A farmer sold a cow for \$48, which was $\frac{3}{5}$ of what he paid for her. How much did the cow cost him?

9. The same farmer sold sheep for \$81, which was $\frac{3}{4}$ of the cost. What was his gain in this transaction?

10. Find a certain number of which 36 is $\frac{4}{5}$. What is $\frac{5}{8}$ of the number?

11. What is the number of which 55 is $\frac{5}{11}$? What is $\frac{6}{11}$ of the same number?

12. What is the number of which 60 is $\frac{5}{12}$? What is $\frac{7}{12}$ of the number? What is $\frac{1}{12}$ of it?

13. The sum of two numbers is 49. Their relation is that of $\frac{3}{4}$ to $\frac{1}{4}$. What are the numbers?

14. A man divided 36 oranges between two children, giving 4 to one as often as he gave 5 to the other. How many oranges did each child receive?

LESSON XX.

1. At \$.50 a copy, how many books can you get for \$5? For \$12.50?

2. How much does a set of supplementary readers for a class of 30 pupils cost, at \$.33 $\frac{1}{3}$ a copy?

3. At \$.25 a copy, what is the cost of a set of Stickney's Third Readers for the same class?

4. At \$.16 $\frac{2}{3}$ a copy, what is the cost of a set of First Readers for the same number of pupils?

5. At \$.12 $\frac{1}{2}$ a copy, how many copy books can be bought for \$1?

6. At \$.08 $\frac{1}{4}$ for one slate, how many slates can you buy for \$1?

7. At \$.06 $\frac{1}{4}$ each, how many pencils can you buy for \$1?

8. At \$.75 for one, how many histories can you buy for \$1.50? For \$3? For \$7.50? For \$10.50?

9. At \$.87 $\frac{1}{2}$ a volume, what will an 8-volume set of Bancroft's History of the United States cost?

10. At \$.33 $\frac{1}{3}$ a copy, how much would the Century Magazine cost for one year?

11. At \$.25 a copy, how much would Scribner's Magazine cost for a year?

12. At \$.06 $\frac{1}{4}$ a pound, how many pounds of cheese can be bought for \$.25? For \$.50? For \$.75?

13. At \$.08 $\frac{1}{3}$ a pound, how many pounds of rice can be bought for \$.25? For \$1.25? For \$3?

14. At \$.12 $\frac{1}{2}$ a dozen, how many dozen eggs will cost \$12.50?

15. If you save \$.12 $\frac{1}{2}$ a day, in how many days will you have saved \$2?

16. If you earn \$ $\frac{5}{8}$ a day for a week and spend \$ $\frac{3}{8}$ a day, how much money will you have by Saturday night?

LESSON XXI.

1. What is the relation of
- $\frac{1}{3}$
- to
- $\frac{1}{2}$
- ?

ANALYSIS. — The relation of $\frac{1}{3}$ to $\frac{1}{2}$ is the relation of $\frac{2}{3}$ to $\frac{1}{2}$, or of 2 to 3, or $\frac{2}{3}$.

SUGGESTION. — Let it be observed that every fraction expresses a possible relation between two quantities or values. For example, $\frac{2}{3}$ expresses the relation of 2 ones to 3 ones, 2 twos to 3 twos, 2 fives to 3 fives, 2 fifths to 3 fifths, 2 tenths to 3 tenths, etc. Values have the same relation whether integral or fractional. Numbers used to express relationship between quantities or values should always be integral and prime to each other before assuming the fractional form.

What is the relation of:

2.	3.	4.	5.
$\frac{1}{2}$ to $\frac{1}{3}$?	$\frac{2}{3}$ to $\frac{3}{4}$?	$\frac{3}{4}$ to $\frac{3}{5}$?	$\frac{1}{5}$ to $\frac{1}{6}$?
$\frac{1}{2}$ to $\frac{2}{3}$?	$\frac{3}{4}$ to $\frac{2}{3}$?	$\frac{1}{4}$ to $\frac{2}{5}$?	$\frac{2}{5}$ to $\frac{5}{6}$?
$\frac{1}{3}$ to $\frac{1}{4}$?	$\frac{1}{3}$ to $\frac{1}{5}$?	$\frac{2}{5}$ to $\frac{3}{4}$?	$\frac{2}{5}$ to $\frac{2}{6}$?
$\frac{1}{4}$ to $\frac{1}{3}$?	$\frac{1}{5}$ to $\frac{2}{3}$?	$\frac{3}{4}$ to $\frac{3}{5}$?	$\frac{2}{6}$ to $\frac{3}{5}$?
$\frac{2}{3}$ to $\frac{1}{2}$?	$\frac{2}{5}$ to $\frac{2}{3}$?	$\frac{3}{5}$ to $\frac{1}{4}$?	$2\frac{1}{2}$ to $3\frac{1}{5}$?

6. If
- $\frac{1}{2}$
- of a yard of ribbon costs \$.18, what is the cost of
- $\frac{1}{3}$
- of a yard?

7. What is
- $\frac{2}{3}$
- of \$.18?

8. If
- $\frac{1}{3}$
- of a yard of ribbon costs \$.08, what is the cost of
- $\frac{1}{2}$
- of a yard?

9. What is
- $\frac{3}{4}$
- of \$.08?

10. If
- $\frac{1}{5}$
- of a quantity of butter costs \$.12, what is the cost of
- $\frac{1}{4}$
- of the quantity?

11. What is
- $\frac{3}{4}$
- of \$.12?

12. If
- $\frac{1}{4}$
- of a quantity of meat costs \$.15, what is the cost of
- $\frac{1}{3}$
- of the whole quantity?

13. What is
- $\frac{4}{5}$
- of \$.15?

14. When
- $\frac{2}{3}$
- of a peck of potatoes costs \$.40, how much should be paid for
- $\frac{1}{4}$
- of a peck?

15. What is
- $\frac{2}{3}$
- of \$.40?

LESSON XXII.

1. If $\frac{2}{3}$ of a yard of silk is worth \$.45, what is $\frac{2}{3}$ of a yard worth?
2. What is $\frac{5}{8}$ of \$.45?
3. If $\frac{2}{3}$ of a pound of tea is worth \$.40, what is $\frac{4}{5}$ of a pound worth?
4. What is $\frac{2}{3}$ of \$.40?
5. If $\frac{3}{5}$ of a quantity of beans costs \$.24, what is the cost of $\frac{3}{4}$ of the quantity? What is the price of the whole quantity?
6. What is $\frac{4}{5}$ of \$.24? What is $\frac{5}{6}$ of \$.24?
7. If $\frac{3}{4}$ of a dozen books cost \$.90, what is the cost of $\frac{5}{6}$ of a dozen?
8. What is $\frac{10}{9}$ of \$.90?
9. What is the cost of a dozen of the books?
10. What is $\frac{4}{5}$ of \$90?
11. If $\frac{5}{6}$ of a quantity of oats costs \$.15, what is the cost of $\frac{5}{6}$ of the quantity?
12. What is $\frac{2}{3}$ of \$.15? $\frac{2}{3}$ of \$.15?
13. If $\frac{7}{8}$ of a quantity of flour is worth \$84, how much is $\frac{7}{12}$ of the whole worth?
14. What is $\frac{3}{4}$ of \$84? $\frac{2}{3}$ of \$84?
15. If \$600 is $\frac{5}{12}$ of the cost of a city lot, what is $\frac{3}{10}$ of the cost? What is the cost of the lot?
16. What is $\frac{4}{5}$ of \$600? $\frac{12}{5}$ of \$600?
17. If $\frac{4}{5}$ of a number of sheep is 96, what is $\frac{5}{6}$ of the number?
18. What is $\frac{2}{3}$ of 96? $\frac{3}{4}$ of 96?
19. If 42 is $\frac{3}{4}$ of some number, what is $\frac{3}{7}$ of the same number?
20. What is $\frac{4}{5}$ of 42? $\frac{4}{5}$ of 42?
21. What is $\frac{2}{3}$ of that number, of which 54 is $\frac{3}{4}$?
22. What is $\frac{4}{5}$ of 54? $\frac{4}{5}$ of 54?

LESSON XXIII.

1. At $\$ \frac{4}{5}$ a yard, what part of a yard of carpet can be bought for $\$ \frac{3}{4}$?

SUGGESTION. — The relation of $\frac{3}{4}$ to $\frac{4}{5}$ is the relation of 15 to 16 or $\frac{15}{16}$.

2. If $\frac{3}{4}$ of a yard of plush is worth $\frac{3}{5}$ of a yard of beaver, what part of a yard of plush is worth a yard of beaver?

3. What is the relation of $\frac{3}{4}$ to $\frac{3}{5}$?

4. If $\frac{3}{4}$ of a gallon of oil is worth $\frac{9}{10}$ of a gallon of cider, how much oil is worth a gallon of cider?

5. What is the relation of $\frac{3}{4}$ to $\frac{9}{10}$?

6. At $\$ \frac{4}{5}$ a pound, how much tea can be bought for $\$ \frac{7}{10}$?

7. What is the relation of $\frac{7}{10}$ to $\frac{4}{5}$?

8. A farmer lays $\frac{3}{4}$ of a rod of stone wall in $\frac{3}{4}$ of an hour. How much wall can he lay in an hour?

9. If $\frac{3}{4}$ of a bushel of corn is exchanged for $\frac{2}{3}$ of a bushel of wheat, how much wheat should be given for a bushel of corn?

10. At $\$ \frac{3}{20}$ a dozen, how many dozen eggs can be bought for $\$ 1$?

11. If $\frac{3}{10}$ of a barrel of apples costs $\$ \frac{9}{20}$, what is the price of a barrel?

12. If $\frac{4}{5}$ of a yard of silk costs $\$ \frac{3}{4}$, how much will 3 yards cost?

13. If $\frac{4}{5}$ of a ton of hay costs $\$ 8\frac{1}{2}$, what is the price per ton?

14. David walked 14 miles; $\frac{5}{7}$ of this distance was $\frac{2}{3}$ the distance his brother walked. How far did the brother walk?

15. If 75 pages is $\frac{3}{4}$ of the number of pages in a book, how many pages are there in the book?

16. What is $\frac{3}{4}$ of 75?

LESSON XXIV.

1. A farmer sold $\frac{3}{8}$ of his farm and had 100 acres left. What was the size of the farm originally?

2. A man paid \$120 for a watch and chain, the chain costing $\frac{2}{3}$ as much as the watch. What was the cost of each?

3. At \$ $\frac{7}{8}$ each, how many books will cost \$3 $\frac{1}{2}$?

4. If $\frac{2}{3}$ of a box of figs costs \$1 $\frac{1}{8}$, what is the price of a box?

5. By what must you multiply one foot to produce 15 inches?

6. What part of a mile makes 120 rods?

7. What part of a ton contains 1800 pounds?

8. What part of a square foot must be set off to get 132 square inches?

9. How many yards of cloth, at \$ $\frac{5}{8}$ a yard, will pay for 4 $\frac{3}{4}$ cords of wood, at \$7 $\frac{1}{2}$ a cord?

10. A book that cost \$1 was sold for \$1 $\frac{1}{8}$. What was the relation of the selling price to the cost?

11. Corn that cost \$ $\frac{5}{8}$ sold for \$ $\frac{7}{8}$. What part of the cost was the gain? What was the relation of the selling price to the cost?

12. What is the relation of 4 $\frac{1}{2}$ to 3 $\frac{1}{2}$? What is the relation of 3 $\frac{1}{2}$ to 4 $\frac{1}{2}$?

13. If $\frac{2}{3}$ of the value of a farm is \$800, what is $\frac{5}{12}$ of its value?

14. A grocer sold $\frac{7}{8}$ of a barrel of vinegar and had 7 gallons left. How many gallons did the barrel hold?

15. He sold 7 barrels of flour for \$35 and lost $\frac{1}{8}$ of the cost. What did 3 barrels of the flour cost?

16. A mows 4 $\frac{1}{2}$ acres of grass, while B mows 3 $\frac{3}{4}$ acres. How many acres will B mow while A mows 7 $\frac{1}{2}$ acres?

17. A man traveled a certain distance in 5 $\frac{3}{4}$ days. What part of the distance did he travel in 3 $\frac{1}{2}$ days?

LESSON XXV.

1. What part of \$1 is $$.12\frac{1}{2}$? $$.37\frac{1}{2}$? $$.62\frac{1}{2}$? $$.87\frac{1}{2}$?
2. What part of a quantity is $.12\frac{1}{2}$ of it? $.37\frac{1}{2}$? $.62\frac{1}{2}$? $.87\frac{1}{2}$?
3. At $$.12\frac{1}{2}$ a pound, how many pounds can be bought for $$.37\frac{1}{2}$? $$.62\frac{1}{2}$? $$.75$? $$.87\frac{1}{2}$?
4. If $.12\frac{1}{2}$ of a quantity costs $\$ \frac{1}{8}$, how much will $.37\frac{1}{2}$ of the quantity cost? $.62\frac{1}{2}$ of the quantity? $.87\frac{1}{2}$ of the quantity?
5. At $$.87\frac{1}{2}$ a yard for carpet, what is the cost of 16 yards? Of 24 yards? Of 32 yards?
6. At the same price, how much carpet will \$1 buy? How many yards can be bought for \$7?
7. If $.37\frac{1}{2}$ of a quantity costs \$30, what is the cost of $.12\frac{1}{2}$ of the quantity? Of $.25$ of the quantity? Of $.62\frac{1}{2}$? Of $.87\frac{1}{2}$?
8. If $.25$ of a quantity cost $\$33\frac{1}{3}$, what will $.5$ of the quantity cost? $.75$ of the quantity?
9. If $.62\frac{1}{2}$ of a quantity cost \$.60, what is the cost of $.12\frac{1}{2}$ of the quantity? Of $.37\frac{1}{2}$ of the quantity?
10. At $$.12\frac{1}{2}$ a pound, how many pounds of lard can be bought for \$3.75.

What is the cost of:

11. 1 dozen pairs of shoes at $\$2.12\frac{1}{2}$ a pair?
12. 2 dozen primers at $$.12\frac{1}{2}$ a copy?
13. 56 geographies at $$.87\frac{1}{2}$ apiece?
14. 48 gallons of molasses at $$.37\frac{1}{2}$ a gallon?
15. 32 bushels of corn at $$.62\frac{1}{2}$ a bushel?
16. At $$.37\frac{1}{2}$ a yard for flannel, how many yards will \$8 $\frac{1}{4}$ buy?
17. A man paid $\$3\frac{3}{4}$ for goods at $$.12\frac{1}{2}$ a yard. How many yards did he buy?

LESSON XXVI.

1. What part of a dollar is $\$.16\frac{2}{3}$? $\$.33\frac{1}{3}$? $\$.66\frac{2}{3}$? $\$.83\frac{1}{3}$?

2. What part of a quantity is $.16\frac{2}{3}$ of it? $.33\frac{1}{3}$? $.5$? $.66\frac{2}{3}$? $.83\frac{1}{3}$?

3. At $\$.16\frac{2}{3}$ a pound, how many pounds of butter can you buy for $\$.33\frac{1}{3}$? For $\$.50$? For $\$.66\frac{2}{3}$? For $\$.83\frac{1}{3}$?

4. If $.16\frac{2}{3}$ of a quantity costs $\$.12\frac{1}{2}$, what is the cost of the quantity?

5. If $.33\frac{1}{3}$ of a quantity costs $\$.37\frac{1}{2}$, what is the cost of the quantity?

6. If $.66\frac{2}{3}$ of a quantity costs $\$.80$, what is the cost of the quantity?

7. If $.83\frac{1}{3}$ of a quantity costs $\$5$, what is the cost of the quantity?

8. If $.83\frac{1}{3}$ of a ton of hay costs $\$10$, what should be the cost of $.16\frac{2}{3}$ of a ton? Of $.33\frac{1}{3}$ of a ton? Of a ton?

9. At the rate of $\$.16\frac{2}{3}$ for 3 oranges, how many oranges can be bought for $\$.50$?

10. At $\$.33\frac{1}{3}$ apiece, what is the cost of a dozen neckties?

11. At $\$.16\frac{2}{3}$ a quire, how many quires of paper can be bought for $\$2\frac{1}{2}$?

12. At $\$.33\frac{1}{3}$ a bushel, how many bushels of oats can be paid for with $\$15$?

13. What is the cost of 10 tons of coal at $\$4.33\frac{1}{3}$ a ton?

14. What is the cost of 21 yards of carpet at $\$1.33\frac{1}{3}$ a yard?

15. At $\$1.33\frac{1}{3}$ a volume, how many books can you buy for $\$20$?

16. I paid $\$25$ for cloth at $\$1.66\frac{2}{3}$ a yard. How many yards did I buy?

17. At $\$3.33\frac{1}{3}$ a barrel, how many barrels of potatoes will cost $\$100$?

LESSON XXVII.

1. A grocer who had 6 bbl. of flour sold $2\frac{2}{3}$ bbl. What part of his flour did he sell?

SUGGESTION. — Note the relation of $\frac{2}{3}$ to $\frac{1}{3}$ as $\frac{2}{1}$.

2. From a supply of 12 tons of coal $7\frac{1}{2}$ tons were sold. What part was sold?

3. From a pile of wood, containing 15 cords, $4\frac{1}{2}$ cords were sold. What part remained unsold?

4. What part of a $3\frac{3}{4}$ days' journey can a man walk in 2 days?

5. A farmer, owning $37\frac{1}{2}$ acres of land, sold 15 acres. What part of his land did he sell?

6. How many rods are $30\frac{1}{4}$ yards?

7. A man walked $21\frac{1}{2}$ miles in 5 hours. At what rate did he walk per hour?

8. 28 is $2\frac{2}{3}$ times what number?

9. $\frac{5}{7}$ of 21 is $\frac{2}{3}$ of what number?

10. $\frac{2}{3}$ of 32 is $\frac{4}{5}$ of what number?

11. $\frac{3}{8}$ of 63 is $\frac{1}{4}$ of what number?

12. A dealer sold a horse for \$120, which was $\frac{2}{3}$ of the cost. What was his gain?

13. A flag pole stands 6 feet in the ground and $\frac{2}{11}$ above ground. How long is the pole?

14. A man, owning $\frac{4}{5}$ of a farm, sold $\frac{2}{3}$ of his share for \$400. At that valuation, how much was the farm worth?

15. Lemons that were bought at the rate of 4 for 5 cents were sold at the rate of 5 for 4 cents. What was the loss on 40 lemons?

16. $\frac{4}{5}$ of 54 is what part of $\frac{3}{11}$ of 88?

17. What is the relation of $\frac{2}{3}$ of 15 to $\frac{3}{8}$ of 64?

18. What is the relation of $\frac{2}{3}$ of 60 to $\frac{4}{5}$ of 40?

19. At $\$ \frac{1}{4}$ a quart, what part of a bushel of seed can be bought for $\$ 3\frac{1}{2}$?

LESSON XXVIII.

1. A can build a wall in 3 days, and B can do the same work in 4 days. In what time can both A and B do it working together ?

SOLUTION. — A can build $\frac{1}{3}$ of the wall in one day ; B can build $\frac{1}{4}$ of it in one day ; together they can build $\frac{7}{12}$ of it in one day. Representing the work as $\frac{12}{12}$ the relation of 12 to 7 is $\frac{12}{7}$, or the time required is $1\frac{5}{7}$ days.

2. A, B, and C can complete a certain piece of work in 5 days. B and C can do it in 8 days. In what time can A do it ?

SUGGESTION. — $\frac{1}{5}$ less $\frac{1}{8}$ is $\frac{3}{40}$, the amount A can do in one day.

3. If 12 men can do a piece of work in $8\frac{1}{2}$ days, in what time can 10 men do a piece of work $2\frac{1}{2}$ times as large ?

4. If 12 men can do a piece of work in $6\frac{1}{4}$ days, how many men can do twice the work in $\frac{3}{4}$ the time ?

SUGGESTION. — What is $\frac{3}{4}$ of twice 12 men ?

5. If 9 men can do a certain piece of work in a given time, how many men can do 5 times the work in $\frac{2}{3}$ of the time ?

6. If 12 men can complete a certain piece of work in a certain time, how many men can do $\frac{3}{4}$ of the work in $\frac{1}{2}$ of the time ?

7. A can do a piece of work in 6 days. A and B can do it in 4 days. In what time can B do it alone ?

8. A can saw a pile of wood in 5 days ; B can do the work in 6 days. In what time can they do it working together ?

9. A can do some work in 4 days, B in 5 days, C in 6 days. In what time can they do the work together ?

10. A, B, and C can dig a ditch in 3 days. A can dig it in 6 days, and B in 8 days. In what time can C dig it ?

LESSON XXIX.

What is the relation of:

- | | |
|--|---|
| 1. $\frac{1}{2}$ to $.33\frac{1}{3}$? | 11. $\frac{2}{3}$ to $.12\frac{1}{2}$? |
| 2. $\frac{1}{3}$ to $.5$? | 12. $\frac{1}{3}$ to $.4$? |
| 3. $\frac{1}{2}$ to $.25$? | 13. $\frac{3}{5}$ to $.75$? |
| 4. $\frac{1}{4}$ to $.5$? | 14. $\frac{3}{4}$ to $.6$? |
| 5. $\frac{1}{3}$ to $.2$? | 15. $\frac{4}{5}$ to $.37\frac{1}{2}$? |
| 6. $\frac{1}{5}$ to $.33\frac{1}{3}$? | 16. $\frac{3}{8}$ to $.8$? |
| 7. $\frac{2}{3}$ to $.5$? | 17. $\frac{1}{3}$ to $.12\frac{1}{2}$? |
| 8. $\frac{1}{2}$ to $.66\frac{2}{3}$? | 18. $\frac{1}{3}$ to $.16\frac{2}{3}$? |
| 9. $\frac{3}{4}$ to $.25$? | 19. $\frac{3}{8}$ to $.12\frac{1}{2}$? |
| 10. $\frac{1}{4}$ to $.75$? | 20. $\frac{1}{3}$ to $.37\frac{1}{2}$? |

What is the relation of:

- | | |
|---|--|
| 21. $.12\frac{1}{2}$ to $\frac{3}{8}$? | 31. $.16\frac{2}{3}$ to $\frac{1}{4}$? |
| 22. $.37\frac{1}{2}$ to $\frac{1}{3}$? | 32. $.25$ to $\frac{1}{3}$? |
| 23. $.12\frac{1}{2}$ to $\frac{5}{8}$? | 33. $.33\frac{1}{3}$ to $\frac{1}{3}$? |
| 24. $.62\frac{1}{2}$ to $\frac{1}{3}$? | 34. $.12\frac{1}{2}$ to $\frac{1}{3}$? |
| 25. $.25$ to $\frac{3}{4}$? | 35. $.66\frac{2}{3}$ to $\frac{5}{8}$? |
| 26. $.75$ to $\frac{1}{4}$? | 36. $.83\frac{1}{3}$ to $\frac{2}{3}$? |
| 27. $.37\frac{1}{2}$ to $\frac{7}{8}$? | 37. $.06\frac{1}{4}$ to $\frac{1}{3}$? |
| 28. $.87\frac{1}{2}$ to $\frac{3}{8}$? | 38. $.66\frac{2}{3}$ to $\frac{1}{18}$? |
| 29. $.5$ to $\frac{5}{8}$? | 39. $.18\frac{3}{4}$ to $\frac{3}{8}$? |
| 30. $.62\frac{1}{2}$ to $\frac{1}{2}$? | 40. $.37\frac{1}{2}$ to $\frac{3}{16}$? |

What is the relation of:

- | | |
|---|---|
| 41. $.16\frac{2}{3}$ to $\frac{5}{8}$? | 48. $1\frac{1}{2}$ to $1.33\frac{1}{3}$? |
| 42. $.83\frac{1}{3}$ to $\frac{1}{3}$? | 49. $1\frac{1}{3}$ to 1.5 ? |
| 43. $.33\frac{1}{3}$ to $\frac{5}{8}$? | 50. $2\frac{1}{2}$ to 1.25 ? |
| 44. $.83\frac{1}{3}$ to $\frac{2}{3}$? | 51. $\frac{5}{4}$ to 2.5 ? |
| 45. $.66\frac{2}{3}$ to $\frac{5}{8}$? | 52. $3\frac{1}{3}$ to 2.25 ? |
| 46. $.83\frac{1}{3}$ to $\frac{2}{3}$? | 53. $2\frac{1}{4}$ to $3.33\frac{1}{3}$? |
| 47. $.25$ to $\frac{1}{4}$? | 54. $1\frac{1}{3}$ to 1.25 ? |

LESSON XXX.

1. The cost of $.12\frac{1}{2}$ of a quantity is \$3 $\frac{1}{2}$. What is the cost of $\frac{3}{8}$ of the quantity?

2. The cost of $.37\frac{1}{2}$ of a quantity is \$.75. What is the cost of $\frac{1}{4}$ of the quantity?

3. The cost of $.16\frac{2}{3}$ of a quantity is \$.62 $\frac{1}{2}$. What is the cost of $\frac{4}{9}$ of the quantity?

4. The cost of $1.33\frac{1}{3}$ of a quantity is \$5. What is the cost of the quantity? Of $\frac{2}{3}$ of the quantity? Of $\frac{1}{3}$ of the quantity? Of $\frac{1}{2}$ of $\frac{1}{3}$ of the quantity?

5. The cost of .7 of a quantity is \$.49. What is the cost of $\frac{2}{5}$ of the quantity?

6. The cost of .6 of a quantity is \$.42. What is the cost of the quantity?

7. The cost of $.08\frac{1}{3}$ of a quantity is \$.25. What is the cost of .25 of the quantity?

8. The cost of .25 of a quantity is \$.75. What is the cost of $\frac{1}{12}$ of the quantity?

9. The cost of $.16\frac{2}{3}$ of a quantity is \$.12. What is the cost of $\frac{1}{12}$ of the quantity?

10. The cost of $\frac{5}{12}$ of a quantity is \$.30. What is the cost of $\frac{1}{6}$ of the quantity?

11. The cost of $.41\frac{2}{3}$ of a quantity is \$.62 $\frac{1}{2}$. What is the cost of $\frac{1}{12}$ of the quantity?

12. What is $\frac{1}{5}$ of $.41\frac{2}{3}$? Of \$.62 $\frac{1}{2}$?

13. What is $\frac{1}{4}$ of $.87\frac{1}{2}$? Of \$.87 $\frac{1}{2}$? What is $\frac{3}{4}$ of $.87\frac{1}{2}$?

14. What is the relation of $.08\frac{1}{3}$ to $.12\frac{1}{2}$? Of $.12\frac{1}{2}$ to $\frac{1}{12}$?

15. What is the relation of $.12\frac{1}{2}$ to $.16\frac{2}{3}$? Of $.16\frac{2}{3}$ to $\frac{1}{3}$?

16. What is the relation of $.37\frac{1}{2}$ to .25? Of .25 to $\frac{3}{8}$?

17. What is the relation of $.33\frac{1}{3}$ to $.41\frac{2}{3}$? Of $.41\frac{2}{3}$ to $\frac{1}{12}$?

18. What is the relation of $.08\frac{1}{3}$ to .25? Of .25 to $\frac{1}{12}$?

19. What is the relation of $.09\frac{1}{11}$ to $.27\frac{3}{11}$? Of $.27\frac{3}{11}$ to $\frac{1}{11}$?

LESSON XXXI.

1. Given the price of $.5$ a quantity, how can you find the price of the quantity?

2. Given the cost of $.33\frac{1}{3}$ of a quantity, how can you find the cost of the quantity?

3. Given the cost of $.5$ a quantity, how can you find the cost of $.33\frac{1}{3}$ of the quantity?

4. Given the cost of $.25$ a quantity, how can you find the cost of $.75$ of the quantity?

5. Given the cost of $.5$ of a quantity, how can you find the cost of $.16\frac{2}{3}$ of the quantity?

6. Given the price of $.5$ a quantity, how can you find the price of $.12\frac{1}{2}$ of the quantity?

7. Given the price of $.5$ a quantity, how can you find the price of $.08\frac{1}{3}$ of the quantity?

8. Given the price of $.5$ a quantity, how can you find the price of $.06\frac{1}{4}$ of the quantity?

9. Given the price of $.62\frac{1}{2}$ a quantity, how can you find the price of $.37\frac{1}{2}$ of the quantity?

10. With the cost of $.12\frac{1}{2}$ of a lot given, how can you find the cost of $\frac{3}{4}$ of the lot?

11. The cost of $.25$ of a lot is \$200. What is the cost of $\frac{6}{12}$ of the lot?

12. The cost of $\frac{1}{6}$ of a quantity being given, how can you find the cost of $.33\frac{1}{3}$ of the quantity?

13. The cost of $\frac{5}{12}$ of a quantity being given, how can you find the cost of $.16\frac{2}{3}$ of the quantity?

14. The cost of $\frac{7}{12}$ of a quantity being given, how can you find the cost of $.25$ of the quantity?

15. Given the cost of $\frac{3}{8}$ of a quantity, how can you find the cost of $.87\frac{1}{2}$ of the quantity?

16. Given the cost of $\frac{3}{8}$ a quantity, how can you find the cost of $.08\frac{1}{3}$ of the quantity?

LESSON XXXII.

1. Change to 5ths: $3\frac{2}{5}$; $4\frac{3}{5}$; $5\frac{4}{5}$; $6\frac{1}{5}$; $7\frac{2}{5}$.
2. Change to 6ths: $2\frac{1}{6}$; $3\frac{2}{6}$; $4\frac{3}{6}$; $5\frac{4}{6}$; $6\frac{5}{6}$.
3. Change to 8ths: $\frac{3}{8}$; $\frac{5}{8}$; $3\frac{1}{8}$; $4\frac{3}{8}$; $5\frac{5}{8}$.
4. Change to 9ths: $3\frac{1}{9}$; $2\frac{2}{9}$; $3\frac{3}{9}$; $6\frac{4}{9}$; $8\frac{5}{9}$.
5. Change to 12ths: $4\frac{1}{12}$; $5\frac{2}{12}$; $6\frac{3}{12}$; $2\frac{4}{12}$; $3\frac{5}{12}$.
6. Change to the simplest form: $\frac{48}{48}$; $\frac{12}{12}$; $\frac{36}{36}$; $\frac{21}{21}$; $\frac{9}{9}$.

What is the sum and what the difference of:

- | | | |
|---|---------------------------------------|--|
| 7. $\frac{2}{8}$ and $\frac{3}{4}$? | 12. $\frac{6}{7}$ and $\frac{7}{8}$? | 17. $\frac{3}{8}$ and $\frac{5}{12}$? |
| 8. $\frac{3}{4}$ and $\frac{5}{8}$? | 13. $\frac{2}{8}$ and $\frac{4}{5}$? | 18. $\frac{5}{8}$ and $\frac{7}{12}$? |
| 9. $\frac{5}{8}$ and $\frac{9}{10}$? | 14. $\frac{3}{8}$ and $\frac{3}{4}$? | 19. $\frac{7}{8}$ and $\frac{2}{3}$? |
| 10. $\frac{9}{10}$ and $\frac{7}{12}$? | 15. $\frac{5}{8}$ and $\frac{2}{3}$? | 20. $\frac{4}{11}$ and $\frac{3}{4}$? |
| 11. $\frac{5}{7}$ and $\frac{6}{8}$? | 16. $\frac{4}{5}$ and $\frac{5}{8}$? | 21. $\frac{7}{8}$ and $\frac{6}{8}$? |

22. A farmer sold $\frac{4}{5}$ of an acre of land to A, $\frac{3}{5}$ of an acre to B, and $\frac{1}{5}$ of an acre to C. How much land did he sell?

23. I paid $\$ \frac{3}{4}$ for coffee, and $\$ \frac{5}{8}$ for tea. How much did I pay for both?

24. How much is $\frac{2}{3}$ of a ton of coal and $\frac{2}{3}$ of a ton?

25. How much wood is $5\frac{1}{2}$ cords increased by $6\frac{1}{2}$ cords?

26. How much hay is $5\frac{5}{8}$ tons and $5\frac{3}{4}$ tons?

27. A man bought a watch for $\$ 10\frac{3}{8}$, and sold it for $\$ 2\frac{3}{4}$ more than he gave for it. How much did he sell it for?

28. How much cloth is required for a suit of clothes, allowing $4\frac{1}{2}$ yards for the coat, $2\frac{1}{2}$ yards for the pants, and $\frac{7}{8}$ of a yard for the vest?

29. When coal is worth $\$ 4\frac{3}{4}$ a ton, and wood $\$ 8\frac{1}{2}$ a cord, how much will 2 tons of coal and $\frac{1}{2}$ of a cord of wood cost?

30. If from 3 apple trees you gather $2\frac{1}{4}$ bushels, $3\frac{3}{4}$ bushels, and $4\frac{1}{2}$ bushels, respectively, how many bushels of apples will you gather in all?

31. A girl bought a dress for $\$ 9\frac{3}{4}$, and a pair of shoes for $\$ 3\frac{5}{8}$. How much did she pay for both?

LESSON XXXIII.

1. If from a gallon can of kerosene $\frac{6}{11}$ of a quart is used, what quantity remains?

2. If a lady goes shopping with \$15 $\frac{3}{4}$, and her purchases amount to \$5 $\frac{3}{4}$, how much money will she have remaining?

3. If from a piece of cloth containing 18 $\frac{3}{4}$ yards, 7 $\frac{3}{4}$ yards are cut, how many yards will remain?

4. If you have \$25 $\frac{1}{2}$ in the savings bank, and draw out \$6 $\frac{1}{2}$, how much money will you then have in the bank?

5. If a box of tea is $\frac{2}{7}$ full, and $\frac{1}{3}$ of that quantity is sold, what part of the box of tea will still remain?

6. James ran $\frac{1}{2}$ of a mile, and John $\frac{2}{10}$ of a mile. Which boy ran the farther, and how much farther did he run?

7. If, having \$25 $\frac{1}{2}$ in the bank, you draw out \$14 $\frac{5}{8}$, how much money will remain?

8. John spent $\frac{2}{3}$ and $\frac{1}{4}$ of his money, and has \$.21 left. How much money had he at first?

9. If he had spent $\frac{2}{3}$ and $\frac{3}{8}$ of his money, and had \$.27 remaining, how much money, in that case, must he have had at first?

10. If, having \$25, a lady pays $\frac{1}{4}$ of it for a hat and \$11 $\frac{1}{2}$ for a dress, how much money will she have remaining?

11. If, from a 15-gallon can of water, you draw $\frac{1}{2}$ and $\frac{1}{3}$ of it, how many gallons remain?

12. If, from a piece of carpet containing 32 $\frac{3}{4}$ yards, 12 $\frac{3}{4}$ yards are cut, how many yards will remain?

13. From what number must 8 $\frac{2}{3}$ be taken to leave 8 $\frac{1}{3}$?

14. What number must be taken from 10 $\frac{5}{8}$ to have for a remainder $1\frac{1}{2}$?

15. If you buy goods to the amount of \$6 $\frac{3}{4}$ and \$7 $\frac{1}{8}$, how much change is due you from a \$10 and a \$5 bill?

LESSON XXXIV.

What is the cost of:

1. 12 bushels of oats, at $\$ \frac{3}{8}$ a bushel?
2. 11 baskets of peaches, at $\$ \frac{5}{8}$ a basket?
3. 16 pounds of butter, at $\$ \frac{3}{4}$ a pound?
4. 10 pounds of rice, at $\$.07\frac{1}{2}$ a pound?
5. $\frac{3}{4}$ of a barrel of flour, at $\$ 5\frac{1}{2}$ a barrel?
6. $\frac{4}{5}$ of a yard of silk, at $\$ 4$ a yard?
7. $8\frac{3}{8}$ melons, at $\$.25$ apiece?
8. $7\frac{3}{5}$ weeks' board, at $\$ 7$ a week?
9. $\frac{3}{5}$ of a yard of silk, at $\$ \frac{7}{8}$ a yard?
10. $\frac{4}{5}$ of a yard of silk, at $\$ \frac{5}{8}$ a yard?
11. $\frac{5}{8}$ of a ton of hay, at $\$ 8\frac{1}{2}$ per ton?
12. 6 mats, at $\$ \frac{5}{8}$ each?
13. $\frac{3}{8}$ of a chest of tea, at $\$ 21\frac{7}{8}$ a chest?
14. A bushel of corn, if 4 bushels cost $\$ 2\frac{3}{4}$?
15. A piece of cloth, if 10 pieces cost $\$ 6\frac{7}{8}$?
16. A bushel of potatoes, if 7 bushels cost $\$ 4\frac{3}{8}$?
17. A barrel of vinegar, if 5 barrels cost $\$ 25\frac{3}{8}$?
18. $4\frac{2}{3}$ cords of wood, at $\$ 8\frac{1}{2}$ a cord?
19. $\frac{1}{8}$ of $18\frac{1}{2}$ yards of silk, at $\$ 3.16\frac{2}{3}$ a yard?
20. $2\frac{1}{2}$ yards of ribbon, at $\$ \frac{2}{3}$ a yard?
21. $3\frac{1}{8}$ yards, at $\$ \frac{3}{4}$ a yard?
22. $2\frac{1}{4}$ yards, at $\$ \frac{4}{5}$ a yard?
23. How many rods in $\frac{3}{8}$ of a mile?
24. How many hours in $1\frac{1}{2}$ of 2 days?
25. How many pounds in $\frac{5}{8}$ of a ton?
26. How many square inches in $\frac{7}{12}$ of a square foot?
27. How many yards in $\frac{9}{7}$ of 14 rods?
28. How many months in $\frac{7}{12}$ of 11 years?
29. How many pecks in $\frac{3}{4}$ of 7 bushels?
30. How many quarts in $\frac{5}{8}$ of 16 gallons?

LESSON XXXV.

1. What is the cost of one pound of sugar, when $\$1\frac{1}{2}$ is paid for 6 pounds?
2. If a man walks $18\frac{2}{3}$ miles in 4 hours, at what rate does he walk per hour?
3. If a boy earns $\$6\frac{1}{2}$ in 11 days, what are his daily wages?
4. How many times can a 3-gallon can be filled from a vessel which holds $16\frac{2}{3}$ gallons?
5. At $\$4$ per ton, how much coal can be bought for $\$21\frac{1}{2}$?
6. The product of two numbers is $77\frac{1}{3}$. One factor is 8. What is the other factor?
7. At $\$2\frac{3}{4}$ a yard, how much satin will $\$3$ pay for?
8. At $\$2\frac{3}{4}$ a yard, how much material will $\$6$ buy?
9. At $\$2\frac{3}{4}$ a pound, how much tea can be bought for $\$12$?
10. In what time can a boy earn $\$7$, if he is able to earn $\$7$ a day?
11. If $\frac{2}{3}$ of a load of wood costs $\$4\frac{1}{3}$, what is the cost of the load?
12. At the rate of $\$1\frac{1}{4}$ apiece, how many handkerchiefs can be bought for $\$2\frac{1}{2}$? For $\$3\frac{1}{2}$? For $\$11\frac{1}{2}$? For $\$1\frac{1}{10}$?
13. At $\$2\frac{3}{4}$ a bushel for vegetables, how many bushels can be bought for $\$1$? For $\$1\frac{1}{2}$? For $\$2.50$?
14. How many times $1\frac{1}{4}$ cords are $5\frac{1}{4}$ cords of wood? $10\frac{1}{4}$ cords? 15 cords?
15. A pipe will fill a cistern in $\frac{2}{3}$ of an hour. How many times can the pipe fill the cistern in $5\frac{1}{3}$ hours?
16. At the rate of $\$25$ for $6\frac{1}{4}$ yards of cloth, what is the cost per yard?
17. At the rate of $\$.65$ for $3\frac{1}{4}$ dozen eggs, what is the price per dozen?

LESSON XXXVI.

1. A boy spent $\frac{2}{3}$ of his money and had \$.35 left. How much money had he at first?
2. Another boy spent $\frac{3}{4}$ of his money and had \$.45 left. How much money had he at first?
3. A farmer sold 40 acres and then had $\frac{3}{4}$ of his land remaining. How much land had he previous to the sale?
4. A boy lost $\frac{2}{3}$ of his marbles and had 15 marbles left. What was his original number of marbles?
5. John has $\frac{2}{3}$ as much money as Charles. They both together have \$.90. How much money has each boy?
6. $\frac{2}{3}$ of Mary's money equals $\frac{1}{3}$ of Annie's. Together they have \$.66. How much money has each?
7. $\frac{2}{3}$ of George's oranges equals $\frac{3}{4}$ of John's. They have 27 oranges between them. How many has each?
8. What number increased by $\frac{2}{3}$ of itself equals 50?
9. What number increased by $\frac{1}{4}$ of itself equals 44?
10. A farmer bought a horse and a cow for \$120. The cost of the cow was $\frac{7}{17}$ of the cost of the horse. What was the cost of each?
11. A man bought a watch and chain. For the watch he paid \$72. $\frac{1}{4}$ of the cost of the watch equals $\frac{2}{3}$ of the cost of the chain. How much did the chain cost?
12. A farmer sowed $\frac{3}{4}$ of his land with oats and the rest with wheat. There were 18 acres of wheat more than of oats. How many acres of each were there?
13. A can mow 6 acres of grass in 5 days, and B can mow 5 acres in 6 days. How many acres of grass can both mow in 8 days?
14. When \$11 $\frac{1}{4}$ is the price paid for 2 $\frac{3}{4}$ yards of cloth, what is the price per yard?
15. How many times $\frac{5}{8}$ is 3 $\frac{3}{4}$? 8 $\frac{1}{8}$? 6 $\frac{3}{8}$?
16. How many times $\frac{2}{3}$ is 6 $\frac{2}{3}$? 7 $\frac{5}{8}$? 2 $\frac{1}{2}$?

LESSON XXXVII.

1. The sum of two numbers is 18; the less is $\frac{1}{3}$ the greater. What are the numbers?

2. The sum of two boys' ages is 31 years. The age of the younger is 5 years less than that of the older. What are their ages?

3. A and B contributed \$35 to a charity fund. B gave $2\frac{1}{2}$ times as much as A. How much did each contribute?

4. In a school of 63 pupils there are twice as many girls as boys. How many girls are there in the school?

5. A farmer had 75 sheep in his hill pasture. This number was 15 more than twice the number of sheep he had in the meadow. How many sheep had he in both places?

6. Two pedestrians travel toward each other from places 110 miles apart, one at the rate of 6 miles an hour, the other at the rate of 5 miles an hour. In how many hours will they meet?

7. A, B, and C have between them \$30. A has twice as much as B, and B has \$2 more than C. How much money has each?

8. What number diminished by $\frac{3}{4}$ of itself equals 9?

9. What number increased by $\frac{3}{8}$ of itself equals 34?

10. $\frac{1}{3}$ of a certain number exceeds $\frac{1}{4}$ of the same number by 16. What is the number?

11. The sum of two numbers is 16; their difference is 2. What are the numbers?

NOTE. — The difference added to the sum equals twice the greater. Why?

12. The sum of two numbers is 40; their difference is 6. What are the numbers?

13. If \$12 is added to $\frac{3}{8}$ of A's money he will have as much money as B. Together they have \$100. How much money has each?

LESSON XXXVIII.

How can a quantity be found :

- | | |
|--|--|
| 1. If $\frac{1}{8}$ of it is given ? | 15. If .2 of it is given ? |
| 2. If $\frac{2}{8}$ of it is given ? | 16. If .6 of it is given ? |
| 3. If $\frac{1}{4}$ of it is given ? | 17. If 1.2 of it is given ? |
| 4. If $\frac{3}{4}$ of it is given ? | 18. If 1.5 of it is given ? |
| 5. If $\frac{5}{8}$ of it is given ? | 19. If $.12\frac{1}{2}$ of it is given ? |
| 6. If $\frac{3}{8}$ of it is given ? | 20. If $.62\frac{1}{2}$ of it is given ? |
| 7. If $\frac{1}{8}$ of it is given ? | 21. If $.37\frac{1}{2}$ of it is given ? |
| 8. If $\frac{5}{8}$ of it is given ? | 22. If .75 of it is given ? |
| 9. If $\frac{1}{8}$ of it is given ? | 23. If $.16\frac{2}{3}$ of it is given ? |
| 10. If $\frac{3}{8}$ of it is given ? | 24. If $.33\frac{1}{3}$ of it is given ? |
| 11. If $\frac{7}{8}$ of it is given ? | 25. If $.66\frac{2}{3}$ of it is given ? |
| 12. If $\frac{2}{11}$ of it is given ? | 26. If $.87\frac{1}{2}$ of it is given ? |
| 13. If $\frac{5}{12}$ of it is given ? | 27. If $.08\frac{1}{3}$ of it is given ? |
| 14. If $\frac{1}{12}$ of it is given ? | 28. If $.41\frac{2}{3}$ of it is given ? |

29. How can the cost of .5 of a quantity be found from the cost of $.33\frac{1}{3}$ of it ?

30. How can the cost of $.33\frac{1}{3}$ of a quantity be found from the cost of .5 of it ?

31. How can the cost of .3 of a quantity be found from the cost of .2 of it ?

32. How can the cost of .4 of a quantity be found from the cost of .3 of it ?

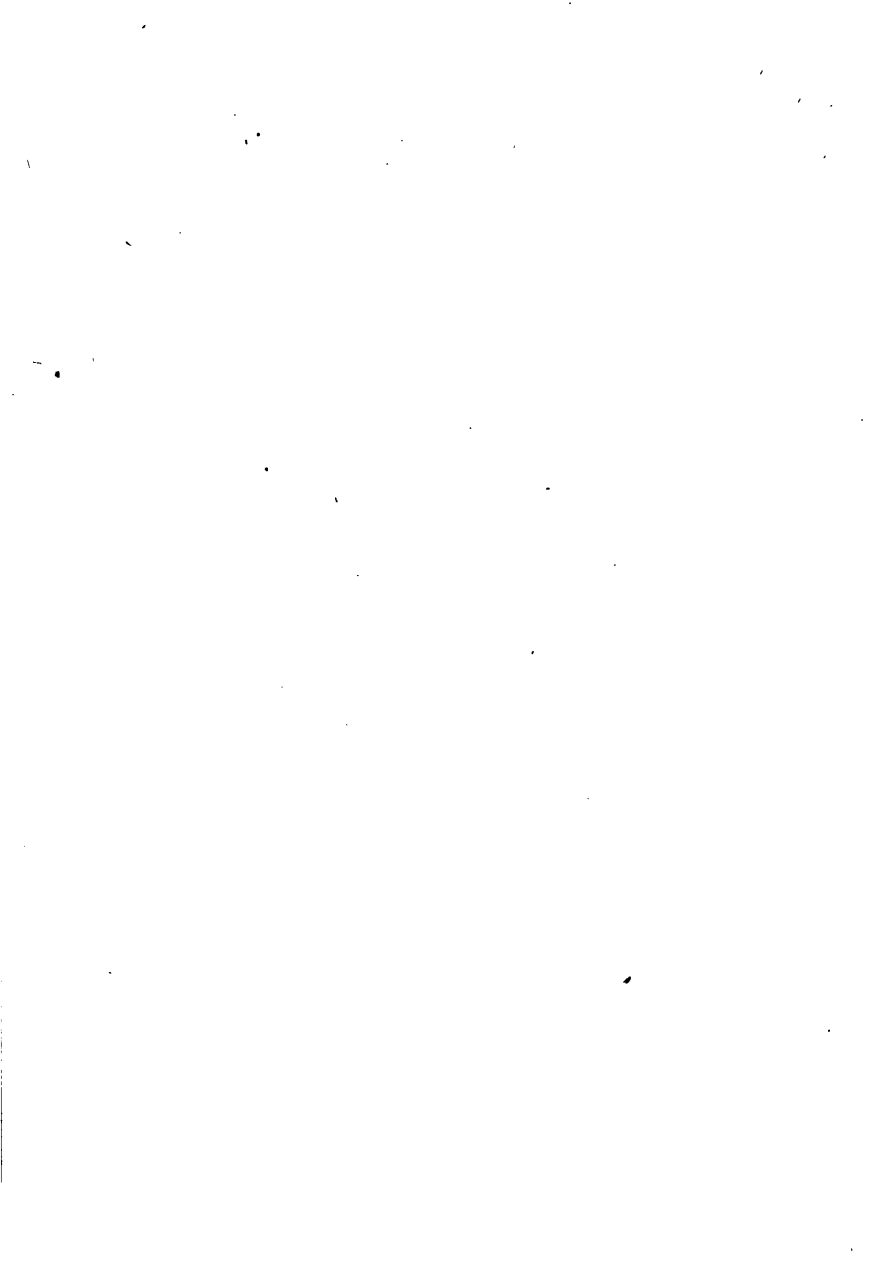
33. How can the cost of $.16\frac{2}{3}$ of a quantity be found from the cost of .2 of it ?

34. How can the cost of .6 of a quantity be found from the cost of .5 of it ?

35. How can the cost of $.33\frac{1}{3}$ of a quantity be found from the cost of .25 of it ?

36. How can the cost of .25 of a quantity be found from the cost of $.37\frac{1}{2}$ of it ?

SIXTH GRADE.



SIXTH GRADE.

LESSON I.

1. What is meant by 50% of a thing or quantity?

SUGGESTION. — 50 % of a quantity means 50 of the 100 equal parts of the quantity.

2. What is 50% of 100 acres?

SUGGESTION. — The relation of 50 to 100 is the relation of 1 to 2, or $\frac{1}{2}$. Hence, 50 % of a quantity is $\frac{1}{2}$ the quantity.

3. What is 50% of a quart of milk? Of a peck of apples? Of a man's time? Of a man's money?

4. What is meant by 25% of a thing or quantity?

SUGGESTION. — 25 % of a quantity means 25 of the 100 equal parts of the quantity.

5. What is 25% of a gallon of kerosene? Of a bushel of apples? Of a man's capital? Of a reading lesson?

SUGGESTION. — The relation of 25 to 100 is the relation of 1 to 4, or $\frac{1}{4}$.

6. What part of a quantity is $33\frac{1}{3}\%$ of it?

SUGGESTION. — The relation of $33\frac{1}{3}$ to 100 is the relation of 1 to 3, or $\frac{1}{3}$.

7. What is $33\frac{1}{3}\%$ of one yard? Of one foot? Of one's bank stock? Of a man's wages?

8. Since $33\frac{1}{3}\%$ of a quantity is $\frac{1}{3}$ of the quantity, what per cent of the quantity is $\frac{2}{3}$ of it?

9. What is $66\frac{2}{3}\%$ of \$6? Of \$12? Of \$18? Of \$33?

10. What per cent of a quantity is $\frac{3}{4}$ of it?

11. What is 75% of 24 rods? Of 32 sheep? Of 48 books?

LESSON II.

1. What part of a quantity is $16\frac{2}{3}\%$ of it?
2. What is $16\frac{2}{3}\%$ of \$42? Of \$54? Of 60 minutes?
3. What per cent of a quantity is $\frac{2}{3}$ of it? $\frac{3}{8}$ of it?
 $\frac{4}{5}$ of it? $\frac{5}{6}$ of it?
4. What part of a quantity is $12\frac{1}{2}\%$ of it?
5. What is $12\frac{1}{2}\%$ of 40 rods? Of 400 yards? Of 32 pints? Of 320 pints?
6. What part of a quantity is $37\frac{1}{2}\%$ of it?
7. What is the relation of $12\frac{1}{2}\%$ to $37\frac{1}{2}\%$ of it?
8. What is $37\frac{1}{2}\%$ of 40 rods? Of 400 yards? Of 24 hours? Of \$48?
9. What part of a quantity is $62\frac{1}{2}\%$ of it?
10. How many times $12\frac{1}{2}\%$ of a quantity is $62\frac{1}{2}\%$ of it?
11. What is $62\frac{1}{2}\%$ of 32 acres? Of 320 acres?
12. What is the relation of $12\frac{1}{2}\%$ to 75% ?
13. What is 75% of 16 oranges? Of 28 cents? Of 44 horses? Of 80 sheep?
14. What part of a quantity is $87\frac{1}{2}\%$ of it?
15. How many times $12\frac{1}{2}\%$ of a quantity is $87\frac{1}{2}\%$ of it?
16. What is the relation of $87\frac{1}{2}\%$ to $62\frac{1}{2}\%$?
17. If $62\frac{1}{2}\%$ of a quantity of oats is 45 bushels, what is $87\frac{1}{2}\%$ of the quantity?
18. What is $\frac{7}{8}$ of 45 bushels?
19. What is $87\frac{1}{2}\%$ of 72 bushels of oats?
20. Given $87\frac{1}{2}\%$ of a quantity, how can the quantity be found?
21. A farmer lost $12\frac{1}{2}\%$ of his sheep. What per cent of his sheep remained?
22. He sold $37\frac{1}{2}\%$ of the flock. What per cent of his flock was unsold?
23. In an orchard, 25% of the trees bear cherries. What per cent of the trees bear other fruits?

LESSON III.

1. What part of a quantity is $8\frac{1}{8}\%$ of it?
2. What is $8\frac{1}{8}\%$ of 6 in.? Of 12 in.? Of 18 in.?
3. What is $8\frac{1}{8}\%$ of 12 mo.? Of 12 doz.? Of 12° ?
4. What is $8\frac{1}{8}\%$ of 12 times 6 rods? Of 12 times 8 yards? Of 12 times 11 feet?
5. Compare $8\frac{1}{8}\%$ of 48 sheep with $16\frac{2}{3}\%$ of 24 sheep?
6. What part of $16\frac{2}{3}\%$ of a quantity is $8\frac{1}{8}\%$ of it?
7. What is $8\frac{1}{8}\%$ of $16\frac{2}{3}\%$ of 72 miles of cable rope?
8. Compare $8\frac{1}{8}\%$ of \$60 with 25% of \$20.
9. Given $8\frac{1}{8}\%$ of a quantity, how can 25% of the quantity be found?
10. Given $16\frac{2}{3}\%$ of a quantity, how can 25% of the quantity be found?
11. Given 25% of a quantity, how can $16\frac{2}{3}\%$ of it be found?
12. Given 25% of a quantity, how can $33\frac{1}{3}\%$ of the quantity be found?
13. There are 66 acres in 25% of a farmer's corn acreage. How many acres are there in $33\frac{1}{3}\%$ of his cornfields?
14. If 25% of his neighbor's corn land is 24 acres, how many acres are there in $16\frac{2}{3}\%$ of his neighbor's cornfields?
15. How many acres of corn land has his neighbor?
16. What part of a quantity is $41\frac{2}{3}\%$ of it?
17. If $41\frac{2}{3}\%$ of the trees in an orchard bear apples, what per cent of the trees do not bear apples?
18. How many times $8\frac{1}{8}\%$ of a quantity is $41\frac{2}{3}\%$ of it?
19. Given 25% of a quantity, how can $41\frac{2}{3}\%$ of it be found?
20. If 6 is $16\frac{2}{3}\%$ of some number, what is $41\frac{2}{3}\%$ of the same number?
21. If 15 is $41\frac{2}{3}\%$ of some number, what is 25% of the same number?

LESSON IV.

1. What part of a quantity is $58\frac{1}{8}\%$ of it?
2. If $58\frac{1}{8}\%$ of a farm is sold, what per cent of the farm is unsold?
3. How many times $8\frac{1}{8}\%$ of a quantity is $58\frac{1}{8}\%$ of the quantity?
4. What is $58\frac{1}{8}\%$ of 48 bbl. of flour? Of 60 tons of coal? Of 84 dozen eggs?
5. What part of a quantity is $91\frac{3}{8}\%$ of it?
6. How many times $8\frac{1}{8}\%$ of a quantity is $91\frac{3}{8}\%$ of it?
7. If $8\frac{1}{8}\%$ of a certain distance is 12 rods, what is $91\frac{3}{8}\%$ of the distance?
8. If $16\frac{3}{8}\%$ of a given distance is 24 miles, what is $33\frac{1}{8}\%$ of the distance?
9. If 90 trees are $33\frac{1}{8}\%$ of the trees in an orchard, how many trees are there in $66\frac{3}{8}\%$ of the whole number? How many trees are there in the orchard?
10. What part of a thing, or quantity, is $6\frac{1}{4}\%$ of it?
11. How many times $6\frac{1}{4}\%$ is $12\frac{1}{4}\%$? $18\frac{3}{4}\%$? 25% ?
12. When 12 is $6\frac{1}{4}\%$ of a number, what is $18\frac{3}{4}\%$ of the same number?
13. What per cent is 5 times $6\frac{1}{4}\%$?
14. What part of a quantity is $31\frac{1}{4}\%$ of it?
15. What is $31\frac{1}{4}\%$ of 64 acres? Of 32 sq. rd.? Of 160 sq. rd.?
16. How many times $6\frac{1}{4}\%$ of a quantity is $43\frac{3}{4}\%$ of it?
17. What is $43\frac{3}{4}\%$ of 160 acres? Of 320 sq. rd.?
18. What is the relation of $31\frac{1}{4}\%$ of a quantity to $43\frac{3}{4}\%$ of it?
19. What is the relation of $\frac{5}{18}$ to $\frac{7}{18}$?
20. What is the relation of $62\frac{1}{2}\%$ of a quantity to $87\frac{1}{2}\%$ of it?
21. What is the relation of $\frac{5}{8}$ to $\frac{7}{8}$?

LESSON V.

What is the relation of :

6 $\frac{1}{4}$ % - 1	1.	6 $\frac{1}{4}$ % to 12 $\frac{1}{2}$ % ?	2.	6 $\frac{1}{4}$ % to 18 $\frac{3}{4}$ % ?
12 $\frac{1}{2}$ % - 2		12 $\frac{1}{2}$ % to 18 $\frac{3}{4}$ % ?		12 $\frac{1}{2}$ % to 25 % ?
18 $\frac{3}{4}$ % - 3		18 $\frac{3}{4}$ % to 25 % ?		12 $\frac{1}{2}$ % to 31 $\frac{1}{4}$ % ?
25 % - 4		25 % to 31 $\frac{1}{4}$ % ?		12 $\frac{1}{2}$ % to 37 $\frac{1}{2}$ % ?
31 $\frac{1}{4}$ % - 5		31 $\frac{1}{4}$ % to 37 $\frac{1}{2}$ % ?		12 $\frac{1}{2}$ % to 50 % ?
37 $\frac{1}{2}$ % - 6		37 $\frac{1}{2}$ % to 43 $\frac{3}{4}$ % ?		12 $\frac{1}{2}$ % to 62 $\frac{1}{2}$ % ?
43 $\frac{3}{4}$ % - 7		43 $\frac{3}{4}$ % to 50 % ?		12 $\frac{1}{2}$ % to 75 % ?
50 % - 8		50 % to 56 $\frac{1}{4}$ % ?		12 $\frac{1}{2}$ % to 87 $\frac{1}{2}$ % ?
56 $\frac{1}{4}$ % - 9		56 $\frac{1}{4}$ % to 62 $\frac{1}{2}$ % ?		18 $\frac{3}{4}$ % to 37 $\frac{1}{2}$ % ?
62 $\frac{1}{2}$ % - 10		62 $\frac{1}{2}$ % to 68 $\frac{3}{4}$ % ?		18 $\frac{3}{4}$ % to 56 $\frac{1}{4}$ % ?
68 $\frac{3}{4}$ % - 11		68 $\frac{3}{4}$ % to 75 % ?		18 $\frac{3}{4}$ % to 75 % ?
75 % - 12		75 % to 81 $\frac{1}{4}$ % ?		31 $\frac{1}{4}$ % to 62 $\frac{1}{2}$ % ?
81 $\frac{1}{4}$ % - 13		81 $\frac{1}{4}$ % to 87 $\frac{1}{2}$ % ?		31 $\frac{1}{4}$ % to 93 $\frac{3}{4}$ % ?
87 $\frac{1}{2}$ % - 14		87 $\frac{1}{2}$ % to 93 $\frac{3}{4}$ % ?		43 $\frac{3}{4}$ % to 87 $\frac{1}{2}$ % ?
93 $\frac{3}{4}$ % - 15		93 $\frac{3}{4}$ % to 100 % ?		87 $\frac{1}{2}$ % to 100 % ?
100 % - 16		100 % to 50 % ?		62 $\frac{1}{2}$ % to 31 $\frac{1}{4}$ % ?

What is the relation and its reciprocal of :

3.	4.	5.
25% to 50 % ?	62 $\frac{1}{2}$ % to 87 $\frac{1}{2}$ % ?	12 $\frac{1}{2}$ % to 56 $\frac{1}{4}$ % ?
25% to 75 % ?	37 $\frac{1}{2}$ % to 87 $\frac{1}{2}$ % ?	12 $\frac{1}{2}$ % to 68 $\frac{3}{4}$ % ?
50% to 75 % ?	12 $\frac{1}{2}$ % to 31 $\frac{1}{4}$ % ?	12 $\frac{1}{2}$ % to 81 $\frac{1}{4}$ % ?
75% to 87 $\frac{1}{2}$ % ?	12 $\frac{1}{2}$ % to 43 $\frac{3}{4}$ % ?	12 $\frac{1}{2}$ % to 93 $\frac{3}{4}$ % ?
6.	7.	8.
18 $\frac{3}{4}$ % to 12 $\frac{1}{2}$ % ?	50 % to 31 $\frac{1}{4}$ % ?	75 % to 62 $\frac{1}{2}$ % ?
31 $\frac{1}{4}$ % to 18 $\frac{3}{4}$ % ?	50 % to 18 $\frac{3}{4}$ % ?	75 % to 37 $\frac{1}{2}$ % ?
37 $\frac{1}{2}$ % to 25 % ?	62 $\frac{1}{2}$ % to 50 % ?	75 % to 18 $\frac{3}{4}$ % ?
37 $\frac{1}{2}$ % to 31 $\frac{1}{4}$ % ?	62 $\frac{1}{2}$ % to 25 % ?	75 % to 31 $\frac{1}{4}$ % ?
37 $\frac{1}{2}$ % to 12 $\frac{1}{2}$ % ?	62 $\frac{1}{2}$ % to 37 $\frac{1}{2}$ % ?	87 $\frac{1}{2}$ % to 62 $\frac{1}{2}$ % ?
50 % to 37 $\frac{1}{2}$ % ?	62 $\frac{1}{2}$ % to 31 $\frac{1}{4}$ % ?	87 $\frac{1}{2}$ % to 25 % ?

LESSON VI.

What is the relation of :

	1.	2.
$8\frac{1}{2}\% - 1$	$8\frac{1}{2}\%$ to $16\frac{2}{3}\%$?	$8\frac{1}{2}\%$ to 25% ?
$16\frac{2}{3}\% - 2$	$16\frac{2}{3}\%$ to 25% ?	$16\frac{2}{3}\%$ to $33\frac{1}{3}\%$?
$25\% - 3$	25% to $33\frac{1}{3}\%$?	$16\frac{2}{3}\%$ to $41\frac{2}{3}\%$?
$33\frac{1}{3}\% - 4$	$33\frac{1}{3}\%$ to $41\frac{2}{3}\%$?	$33\frac{1}{3}\%$ to $41\frac{2}{3}\%$?
$41\frac{2}{3}\% - 5$	$41\frac{2}{3}\%$ to 50% ?	$41\frac{2}{3}\%$ to $58\frac{1}{3}\%$?
$50\% - 6$	50% to $58\frac{1}{3}\%$?	$58\frac{1}{3}\%$ to $83\frac{1}{3}\%$?
$58\frac{1}{3}\% - 7$	$58\frac{1}{3}\%$ to $66\frac{2}{3}\%$?	$41\frac{2}{3}\%$ to $83\frac{1}{3}\%$?
$66\frac{2}{3}\% - 8$	$66\frac{2}{3}\%$ to 75% ?	$41\frac{2}{3}\%$ to $91\frac{2}{3}\%$?
$75\% - 9$	75% to $83\frac{1}{3}\%$?	$66\frac{2}{3}\%$ to 100% ?
$83\frac{1}{3}\% - 10$	$83\frac{1}{3}\%$ to $91\frac{2}{3}\%$?	$41\frac{2}{3}\%$ to 100% ?
$91\frac{2}{3}\% - 11$	$91\frac{2}{3}\%$ to 100% ?	50% to $83\frac{1}{3}\%$?
$100\% - 12$	100% to $33\frac{1}{3}\%$?	$83\frac{1}{3}\%$ to 50% ?

What is the relation and its reciprocal of :

3.	4.	5.
$16\frac{2}{3}\%$ to $41\frac{2}{3}\%$?	50% to $41\frac{2}{3}\%$?	$41\frac{2}{3}\%$ to $33\frac{1}{3}\%$?
$16\frac{2}{3}\%$ to 50% ?	50% to $58\frac{1}{3}\%$?	$41\frac{2}{3}\%$ to 25% ?
$16\frac{2}{3}\%$ to $58\frac{1}{3}\%$?	50% to $33\frac{1}{3}\%$?	$41\frac{2}{3}\%$ to $16\frac{2}{3}\%$?
$16\frac{2}{3}\%$ to $66\frac{2}{3}\%$?	50% to $66\frac{2}{3}\%$?	$41\frac{2}{3}\%$ to $58\frac{1}{3}\%$?
$16\frac{2}{3}\%$ to $83\frac{1}{3}\%$?	50% to $16\frac{2}{3}\%$?	$41\frac{2}{3}\%$ to $66\frac{2}{3}\%$?
$16\frac{2}{3}\%$ to 100% ?	50% to $83\frac{1}{3}\%$?	$41\frac{2}{3}\%$ to $91\frac{2}{3}\%$?
6.	7.	8.
75% to 100% ?	$66\frac{2}{3}\%$ to $8\frac{1}{3}\%$?	100% to $41\frac{2}{3}\%$?
75% to $8\frac{1}{3}\%$?	$66\frac{2}{3}\%$ to $16\frac{2}{3}\%$?	100% to $58\frac{1}{3}\%$?
75% to $83\frac{1}{3}\%$?	$66\frac{2}{3}\%$ to 25% ?	100% to $66\frac{2}{3}\%$?
75% to $33\frac{1}{3}\%$?	$66\frac{2}{3}\%$ to $41\frac{2}{3}\%$?	100% to $108\frac{1}{3}\%$?
75% to $41\frac{2}{3}\%$?	$66\frac{2}{3}\%$ to 75% ?	100% to $106\frac{1}{3}\%$?
75% to $16\frac{2}{3}\%$?	$66\frac{2}{3}\%$ to $83\frac{1}{3}\%$?	100% to $112\frac{1}{3}\%$?

LESSON VII.

What is the per cent value of:

1.	2.	3.	4.	5.	6.
$\frac{1}{2}$?	$\frac{1}{5}$?	$\frac{1}{8}$?	$\frac{1}{10}$?	$\frac{1}{12}$?	$\frac{1}{18}$?
$\frac{3}{4}$?	$\frac{2}{5}$?	$\frac{2}{8}$?	$\frac{2}{10}$?	$\frac{2}{12}$?	$\frac{2}{18}$?
$2\frac{1}{4}$?	$\frac{3}{5}$?	$\frac{3}{8}$?	$\frac{3}{10}$?	$\frac{3}{12}$?	$\frac{3}{18}$?
$\frac{1}{3}$?	$\frac{4}{5}$?	$\frac{4}{8}$?	$\frac{4}{10}$?	$\frac{4}{12}$?	$\frac{4}{18}$?
$\frac{2}{3}$?	$\frac{5}{5}$?	$\frac{5}{8}$?	$\frac{5}{10}$?	$\frac{5}{12}$?	$\frac{5}{18}$?
$\frac{3}{3}$?	$\frac{1}{5}$?	$\frac{6}{8}$?	$\frac{6}{10}$?	$\frac{6}{12}$?	$\frac{6}{18}$?
$\frac{4}{3}$?	$\frac{2}{5}$?	$\frac{7}{8}$?	$\frac{7}{10}$?	$\frac{7}{12}$?	$\frac{7}{18}$?
$\frac{5}{3}$?	$\frac{3}{5}$?	$\frac{8}{8}$?	$\frac{8}{10}$?	$\frac{8}{12}$?	$\frac{8}{18}$?
$\frac{1}{4}$?	$\frac{4}{5}$?	$\frac{10}{8}$?	$\frac{9}{10}$?	$\frac{9}{12}$?	$\frac{9}{18}$?
$\frac{2}{4}$?	$\frac{5}{5}$?	$\frac{1}{7}$?	$\frac{10}{10}$?	$\frac{10}{12}$?	$\frac{10}{18}$?
$\frac{3}{4}$?	$\frac{6}{5}$?	$\frac{2}{7}$?	$\frac{11}{10}$?	$\frac{11}{12}$?	$\frac{11}{18}$?
$\frac{5}{4}$?	$\frac{7}{5}$?	$\frac{1}{9}$?	$\frac{12}{10}$?	$\frac{12}{12}$?	$\frac{12}{18}$?
$\frac{6}{4}$?	$\frac{8}{5}$?	$\frac{2}{9}$?	$\frac{15}{10}$?	$\frac{14}{12}$?	$\frac{15}{18}$?

7. What per cent of a quantity is equal to the quantity ?

8. What per cent of 1 is 1 ? Of 2 is 2 ? Of $2\frac{1}{2}$ is 5 ?

9. If $33\frac{1}{3}\%$ of a property was destroyed by fire, and $16\frac{2}{3}\%$ of it by water, what per cent of it was destroyed ?

10. If $62\frac{1}{2}\%$ of a man's capital was invested in land, $12\frac{1}{2}\%$ in bank stock, and the rest uninvested, what per cent of his capital was uninvested ?

11. A boy spent $37\frac{1}{2}\%$ of his money for a suit of clothes. What per cent of his money remained ?

12. What per cent of a farm is retained, when $62\frac{1}{2}\%$ of it is sold ?

13. What per cent of a journey can be made in one day, if 48% of it can be made in 6 days ?

14. If 72% of a property is equally distributed among 8 heirs, what per cent does each heir receive ?

LESSON VIII.

1. What per cent of a barrel of flour is $\frac{2}{3}$ of it?
2. A man saves $\frac{5}{8}$ of his wages. What per cent of his earnings does he spend?
3. A farmer lost $\frac{3}{8}$ of his sheep. What per cent of his sheep did he save?
4. A merchant sold $\frac{5}{12}$ of his stock of carpets. What per cent of the stock remained unsold?
5. The same merchant sold $\frac{5}{16}$ of his stock of boots and shoes. What per cent did he still have unsold?
6. A man spends $\frac{5}{8}$ of his earnings. What per cent does he save?
7. A stock raiser disposed of $\frac{7}{12}$ of his stock. What per cent of it remained?
8. A corporation declared a dividend of $\frac{5}{8}$ of its profits. The remainder was added to the sinking fund. What per cent went into the sinking fund?
9. A man kept $\frac{1}{3}$ of his capital on deposit, invested $\frac{1}{4}$ of it, and used the balance in business. What per cent of his capital did he use in business?
10. If 3 pecks of apples are sold from a 2-bushel basketful, what per cent of the apples will remain?
11. A merchant can pay $\frac{9}{16}$ of his debts. What per cent of them must remain unpaid?
12. A merchant sells goods at $\frac{4}{5}$ of their cost. What is his per cent of profit?
13. If he had sold at $\frac{4}{5}$ of the cost, what would have been his per cent of profit?
14. If a grocer sells butter at $\frac{3}{4}$ of the cost, what per cent profit does he make?
15. If the butter had been sold for $\frac{1}{2}$ of the cost, what would have been his per cent of profit? If it had been sold at $\frac{1}{4}$ of the cost?

LESSON IX.

1. A farmer, who had 56 sheep, sold $62\frac{1}{2}\%$ of them. How many sheep did he sell?

2. The same farmer had 160 acres of land and sold $87\frac{1}{2}\%$ of it. What per cent of the land did he retain, and how many acres did he sell?

3. A drover, who had 150 hogs, sold 20% of them. How many hogs remained unsold?

4. A train of cars, running at the rate of 30 miles an hour, increased its speed $33\frac{1}{3}\%$. What was its speed then?

5. A, owning $\frac{2}{3}$ of a mill sold $62\frac{1}{2}\%$ of his share to B, who owned the rest of it? What part of the mill did each then own?

6. How many acres of land are $6\frac{1}{4}\%$ of 64 acres? $12\frac{1}{2}\%$?

7. A miller sold $16\frac{2}{3}\%$ of 42 barrels of flour for as many dollars per barrel as there were barrels sold. What was the price of the flour per barrel?

8. What is 120% of 50 tons of coal?

9. What is 125% of 48 tons of coal?

10. What is $133\frac{1}{3}\%$ of 60 tons of coal?

11. What is 150% of 18 oranges?

12. What is $116\frac{2}{3}\%$ of 42 gallons of wine?

13. If I wish to draw from the bank $37\frac{1}{2}\%$ of a deposit of \$400, for what amount must I make a check?

14. If property valued at \$1500 is insured at $\frac{2}{3}$ of its value, what is the cost of insurance at 2% ?

15. A farmer sold 30% of his flock of 150 sheep at \$2 a head. How much did he receive for the sheep?

16. What is the cost of $12\frac{1}{2}\%$ of 96 acres of land at \$12 an acre?

17. What is the cost of $41\frac{2}{3}\%$ of 60 bushels of grain, at \$1.25 per bushel.

LESSON X.

1. If \$ 2000 is 50% of the cost of a house and lot, what was the cost?

2. If \$ 300 is $33\frac{1}{3}\%$ of what was paid for the lot, what was the cost of the lot?

3. If \$ 50 is 25% of the cost of a horse, what is the cost of the horse?

4. If \$ 1200 is 20% of the value of my house, what is its value?

5. If \$ 500 is $16\frac{2}{3}\%$ of A's bank deposit, how much money has he in bank?

6. If \$ 600 is $12\frac{1}{2}\%$ of B's bank deposit, how much money has B in bank?

7. If \$ $22\frac{1}{2}$ is 10% of the price of a fur coat, what is the value of the coat?

8. If 10 months is $8\frac{1}{3}\%$ of a boy's age, how old is he?

9. If 5 years is $6\frac{1}{4}\%$ of the age of an old man, what is his age?

10. If \$ 24 is 60% of the price paid for a suit of clothes, how much was paid for them?

11. If \$ 30 is 30% of the price paid for an overcoat, what was the price of the coat?

12. If \$ 120 is 75% of C's monthly salary, what is his salary?

13. If \$ 900 is $37\frac{1}{2}\%$ of A's annual salary, what salary does he receive?

14. If \$ 30 is $31\frac{1}{4}\%$ of what was paid for a 2-seated carriage, how much did it cost?

15. If \$ 500 is $62\frac{1}{2}\%$ of the price of a lot, what is its value?

16. If $41\frac{2}{3}\%$ of a certain field equals 60 square rods, how large is the field?

17. Find the number of which 21 is $58\frac{1}{3}\%$.

LESSON XI.

1. If 12 tons of coal are 6% of the quantity in a coal-yard, what amount of coal is there in the yard?

SOLUTION. — The relation of 12 to .06 is the relation of 1200 to 6. Or, the relation of the quantity to the rate is 100 to 6. $\frac{1}{6}$ of 12 tons is 200 tons.

2. Find the number of dollars of which \$15 is 3%.

3. Find the sum of money of which \$24 is 6%.

4. Find the amount of which \$16 is 4%.

5. Find the number of miles of which 320 rods is 10%.

6. Find the amount of land of which 35 acres is 7%.

7. Find the distance of which 63 miles is 9%.

8. Find the quantity of coal of which 200 pounds is 2%.

9. What is the length of a cable, 45 feet being 5% of the length?

10. A man paid \$18 for a coat. How much money had he, if the price of the coat was 6% of it?

11. A lady paid \$20 for a cloak. This amount was 5% of her money. How much money did she have before she bought the cloak?

12. An agent was paid \$10 for collecting a bill. What was the amount of the bill, the agent's fee being $3\frac{1}{8}\%$ of it?

13. How many acres are there in a cornfield, if 14 acres are 7% of it?

14. How many acres are there in a wheat field, if 7 acres are $3\frac{1}{2}\%$ of it?

15. How much land is there in a man's farm, if 21 acres are $10\frac{1}{2}\%$ of it?

16. How long is a flag pole, if 45 feet are $37\frac{1}{2}\%$ of its length?

17. \$200 is 5% of how much bank stock?

18. \$900 is 6% of how much gas stock?

19. \$330 is 11% of what value in U.S. 6's?

LESSON XII.

1. What per cent of 1 is 1? Of $\frac{1}{8}$ is $\frac{1}{8}$? Of .5 is .5?
Of .25 is .25?

2. What per cent of 3 is 2? Of 2 is 3?

SUGGESTION.—2 is $\frac{2}{3}$ of 3, or $66\frac{2}{3}\%$. 3 is $\frac{3}{2}$ of 2, or 150% .

What per cent:

3.

Of 4 is 3?

Of 3 is 4?

Of 5 is 2?

Of 2 is 5?

Of 5 is 3?

Of 3 is 5?

Of 5 is 4?

Of 4 is 5?

4.

Of 3 is 1?

Of 4 is 1?

Of 5 is 1?

Of 6 is 1?

Of 7 is 1?

Of 8 is 1?

Of 9 is 1?

Of 10 is 1?

5.

Of 40 is 4?

Of 30 is 6?

Of 18 is 3?

Of 15 is 10?

Of 21 is 14?

Of 16 is 12?

Of 36 is 30?

Of 40 is 32?

6.

Of .8 is .2 ?

Of .2 is .5 ?

Of .7 is .3 ?

Of .45 is .15 ?

Of .27 is .18 ?

Of .25 is .12 $\frac{1}{2}$?

7.

Of $\frac{5}{8}$ is $\frac{3}{8}$?Of $\frac{3}{8}$ is $\frac{5}{8}$?Of $\frac{5}{6}$ is $\frac{2}{3}$?Of $\frac{8}{11}$ is $\frac{4}{11}$?Of $\frac{9}{9}$ is $\frac{4}{9}$?Of $\frac{4}{9}$ is $\frac{8}{9}$?

8.

Of .25 is .08 $\frac{1}{8}$?Of .25 is .16 $\frac{2}{3}$?Of .25 is .18 $\frac{1}{4}$?Of .25 is .61 $\frac{1}{4}$?Of .25 is .31 $\frac{1}{4}$?Of .25 is .33 $\frac{1}{3}$?

9. A grocer bought 120 bushels of potatoes, but 30 bu. were unsalable. What per cent of the potatoes were bad?

10. A boy having \$.30 spent \$.12 for fruit. What per cent of his money did he spend?

11. In a school of 63 pupils there are 42 girls. What per cent of the pupils are girls?

12. The distance from A to B is 24 miles, and the distance from A to C is 80 miles. What per cent of the distance from A to C is the distance from A to B?

LESSON XIII.

1. What per cent of 2 bushels is 6 pecks ?
2. What per cent of 5 quarts is 3 pints ?
3. What per cent of 6 pecks is 6 quarts ?
4. What per cent of 5 feet is 5 inches ?
5. What per cent of $.5$ of a day is $.08\frac{1}{2}$ of a day ?
6. What per cent of 12 gallons is 8 quarts ?
7. What per cent of 8 sq. yd. is 32 sq. ft. ?
8. What per cent of 3 days is $\frac{3}{4}$ of a day ?
9. What per cent of a ton is 800 pounds ?
10. What per cent of an hour is 36 minutes ?
11. What per cent of 200 rods is 80 rods ?
12. What per cent of 200 feet is 60 feet ?
13. What per cent of 5 bushels is 40 quarts ?
14. What per cent of an acre is 96 sq. rd. ?
15. What per cent of a day is 10 hours ?
16. What per cent of a mile is 40 rods ?
17. What per cent of an hour is 48 minutes ?
18. What per cent of 200 yards is 120 yards ?
19. What per cent of an acre is 120 sq. rd. ?
20. What per cent of 84 acres is 63 acres ?
21. What per cent of 55 tons is 44 tons ?
22. What per cent of 25 oranges is 15 oranges ?
23. What per cent of a field $\frac{1}{4}$ of a mile square is a field 20 rods square ?
24. What per cent of the square of 4 is the square of 1 ?
25. What per cent of the square of 8 is the square of 4 ?
26. What per cent of the square of 10 is the square of 5 ?
27. What per cent of the square of 9 is the square of 6 ?
28. What per cent of the square of 6 is the square of 9 ?
29. What per cent of the square of 9 is the square of 6 ?
30. What per cent of the square of 3 is the square of 12 ?
31. What per cent of the square of 4 is the square of 6 ?

LESSON XIV.

1. What number increased by $\frac{1}{3}$ of itself equals 30 ?
2. 30 is 150% of what number ?
3. What number increased by $\frac{1}{2}$ of itself equals 20 ?
4. 20 is $133\frac{1}{3}\%$ of what number ?
5. What number increased by $\frac{1}{4}$ of itself equals 45 ?
6. 45 is 125% of what number ?
7. What number increased by $\frac{1}{5}$ of itself equals 54 ?
8. 54 is 120% of what number ?
9. What number increased by $\frac{1}{6}$ of itself equals 42 ?
10. 42 is $116\frac{2}{3}\%$ of what number ?
11. What number increased by $\frac{1}{8}$ of itself equals 27 ?
12. 27 is $112\frac{1}{2}\%$ of what number ?
13. What number increased by $\frac{2}{10}$ of itself equals 39 ?
14. 39 is 130% of what number ?
15. What number increased by $\frac{1}{12}$ of itself equals 65 ?
16. 65 is $108\frac{1}{3}\%$ of what number ?
17. What number increased by $\frac{1}{8}$ of itself equals 34 ?
18. 34 is $106\frac{1}{4}\%$ of what number ?
19. What number increased by 50% of itself equals 15 ?
- 18 ? 24 ? 33 ? 48 ?
20. What number increased by $33\frac{1}{3}\%$ of itself equals 12 ?
- 120 ? 1200 ? 32 ? 320 ? 3200 ?
21. What number increased by 25% of itself equals 15 ?
- 150 ? 1500 ? 35 ? 350 ? 3500 ?
22. What number increased by 20% of itself equals 18 ?
- 180 ? 1800 ? 42 ? 420 ? 4200 ?
23. What number increased by $16\frac{2}{3}\%$ of itself equals
- 14 ? 140 ? 1400 ? 21 ? 280 ? 4200 ?
24. What number increased by $12\frac{1}{2}\%$ of itself equals 27 ?
- 270 ? 2700 ? 36 ? 450 ? 5400 ?
25. What number increased by $8\frac{1}{3}\%$ of itself equals 14 ?
- 140 ? 1400 ? 26 ? 390 ? 5200 ?

LESSON XV.

1. What number diminished by $33\frac{1}{3}\%$ of itself equals .24? .30? .45? .60?

2. A man sold land for \$1200, which was $33\frac{1}{3}\%$ less than cost? How much did the land cost?

3. A broker sold bonds for \$1800, which was $33\frac{1}{3}\%$ less than their par value. Compare the selling price, or market value, with the par value of the bonds.

4. What number diminished by 25% of itself equals .12? .18? .27? .42?

5. At a bargain sale, goods were sold at 25% less than the regular price. What was the regular price of goods that sold for \$1.50? For \$2.10? For \$2.70?

6. What amount would be saved to the buyer at such a sale, on a bill of goods amounting to \$12.45?

7. The area of a gentleman's park is 25% more than 120 acres. How large is the park?

8. What number diminished by 40% of itself equals .15? 1.5? 15? .18? 1.8? 18?

9. A has 240 sheep, which is 40% less than the number B has. How many sheep has B?

10. What number diminished by $16\frac{2}{3}\%$ of itself equals .25? 2.5? 25? .55? 5.5? 55?

11. A walked 45 miles, which was $16\frac{2}{3}\%$ less than the distance B walked. What is the relation of the distance B walked to the distance A walked?

12. George is 10 years of age, and his age is $16\frac{2}{3}\%$ less than Mary's. What is Mary's age?

13. What number diminished by $12\frac{1}{2}\%$ of itself equals .14? 1.4? 14? .35? 3.5? 35?

14. A merchant, after selling 75% of a piece of goods, finds that he has $9\frac{3}{4}$ yd. remaining. How many yards were there originally in the piece?

LESSON XVI.

1. What is the relation of a certain quantity to $112\frac{1}{2}\%$ of the same quantity? What is the reciprocal relation?
2. Given the price of a quantity, how can the price of $112\frac{1}{2}\%$ of the quantity be found?
3. Given the price of $112\frac{1}{2}\%$ of a quantity, how can the price of the quantity be found?
4. A load of potatoes sold for \$72. How much is another load worth which is $112\frac{1}{2}\%$ of it in quantity?
5. If $112\frac{1}{2}\%$ of a quantity is worth \$90, how much is 100% of the quantity worth?
6. What is the relation of a certain quantity to $116\frac{2}{3}\%$ of the quantity? What is the reciprocal relation?
7. Given the price of a quantity, how can the price of $116\frac{2}{3}\%$ of the quantity be found?
8. Given the price of $116\frac{2}{3}\%$ of a quantity, how can the price of the quantity be found?
9. A quantity of flour is worth \$84. What is $116\frac{2}{3}\%$ of the quantity worth?
10. What is the relation of a quantity to $137\frac{1}{2}\%$ of the quantity?
11. Given the cost of a quantity, how can the cost of $137\frac{1}{2}\%$ of the quantity be found?
12. The cost of a certain quantity of sugar is \$24. What is $137\frac{1}{2}\%$ of the quantity worth?
13. What is the actual profit realized from a garden, if \$220 is $137\frac{1}{2}\%$ of it?
14. Another garden realized a certain profit, $162\frac{1}{2}\%$ of which is \$260. What was the actual profit realized from the second garden?
15. A man paid \$42 for an overcoat, which was $12\frac{1}{2}\%$ less than the price first asked by the retailer. What was the asking price?

LESSON XVII.

1. A man, after expending 20% of his money, had \$ 320 remaining. How much money did he spend?

2. Owning 75% of a mine, I sold $33\frac{1}{3}\%$ of my share. What per cent of the mine do I still own?

3. If \$ 350 is $16\frac{2}{3}\%$ more than was paid for some sheep, how much did the sheep cost?

4. An agent received \$ 15, which was 3% of a debt collected. What was the amount of the debt?

5. Find a certain number of which $66\frac{2}{3}\%$ exceeds 40% by 200?

6. Find the number of which $16\frac{2}{3}\%$ exceeds $8\frac{1}{3}\%$ by 8.

7. What quantity of milk is required in a certain hotel daily, if 60 gallons is 25% less than the quantity required?

8. What is 25% more than the cost of a cow, if \$ 39 is $8\frac{1}{3}\%$ more than its cost?

9. A teacher drawing a salary of \$ 800, saves \$ 300. What per cent of her salary does she save?

10. What per cent more than one half of her salary does she spend?

11. Some goods were sold at a bargain sale for \$ 45, which was $62\frac{1}{2}\%$ of the cost. What was the cost?

12. If \$ 12, the cost of a saddle, is $8\frac{1}{3}\%$ of the cost of a horse, what is the cost of the horse?

13. An agent sold a lot at $31\frac{1}{4}\%$ advance on the cost, and gained \$ 150. What was the cost of the lot?

14. A fruit vender sold oranges for \$.45 a dozen, which was $87\frac{1}{2}\%$ more than cost. What was the cost?

15. The same man sold a quantity of fruit for \$ 55, which was $166\frac{2}{3}\%$ of the cost. What was the cost?

16. A florist sold flowers for \$ 46, which was $287\frac{1}{2}\%$ of the cost of production. How much did it cost to raise the flowers?

LESSON XVIII.

1. 25% of a quantity is what per cent of $\frac{5}{8}$ of it?
2. $16\frac{2}{3}\%$ of a quantity is what per cent of $\frac{5}{8}$ of it?
3. $12\frac{1}{2}\%$ of a quantity is what per cent of $\frac{3}{4}$ of it?
4. $8\frac{1}{8}\%$ of a quantity is what per cent of .25 of it?
5. $37\frac{1}{2}\%$ of a quantity is what per cent of $.62\frac{1}{2}$ of it?
6. 15% of a quantity is what per cent of .6 of it?
7. A's money is 50% more than B's. What per cent of A's money is B's?
8. What per cent less than A's money is B's?
9. Suppose A's money had been $33\frac{1}{3}\%$ more than B's. What per cent less than A's money would B's then have been?
10. A earns \$80 per month and B \$70 per month. What per cent of A's salary is B's?
11. If B's salary had been \$66 $\frac{2}{3}$ per month and A's \$62 $\frac{1}{2}$ per month, what per cent of B's salary would A's have been?
12. What per cent of a quantity is 25% of .8 of it?
13. What per cent of a quantity is 40% of $\frac{5}{8}$ of it?
14. A quantity is what per cent of $\frac{3}{4}$ of .6 of it?
15. $6\frac{1}{4}\%$ of a quantity is what per cent of $.18\frac{1}{4}$ of it?
16. $12\frac{1}{2}\%$ of a quantity is what per cent of $.31\frac{1}{4}$ of it?
17. $18\frac{3}{4}\%$ of a quantity is what per cent of $.37\frac{1}{2}$ of it?
18. $43\frac{3}{4}\%$ of a quantity is what per cent of $.62\frac{1}{2}$ of it?
19. $8\frac{1}{8}\%$ of a quantity is what per cent of .25 of it?
20. $33\frac{1}{3}\%$ of a quantity is what per cent of $.41\frac{1}{3}$ of it?
21. 50% of a quantity is what per cent of $.66\frac{2}{3}$ of it?
22. 75% of a quantity is what per cent of $.83\frac{1}{3}$ of it?
23. A quantity is what per cent of $.66\frac{2}{3}$ of it?
24. A quantity is what per cent of $.37\frac{1}{2}$ of it?
25. A quantity is what per cent of $.62\frac{1}{2}$ of it?
26. A quantity is what per cent of $\frac{3}{8}$ of .5 of it?

LESSON XIX.

1. If you buy for \$.01 and sell for \$.02, what is the gain per cent?

SUGGESTION.—The question here is: What is the relation of gain to cost? Since the gain equals the cost, the relation of 1 to 1 is 100%.

2. If you buy for \$.02 and sell for \$.01, what is the loss per cent?

3. If you buy for \$.01 and sell for \$.03, what is the gain per cent?

SUGGESTION.—The relation of gain to cost here is 2 to 1, or 200%.

What is the gain or loss per cent:

4. If you buy for \$.02 and sell for \$.03?
5. If you buy for \$.03 and sell for \$.02?
6. If you buy for \$.02 and sell for \$.05?
7. If you buy for \$.05 and sell for \$.03?
8. If you buy for \$.03 and sell for \$.04?
9. If you buy for \$.04 and sell for \$.03?
10. If you buy for \$.04 and sell for \$.05?
11. If you buy for \$.05 and sell for \$.04?
12. If you buy for \$.05 and sell for \$.06?
13. If you buy for \$.05 and sell for \$.07?
14. If you buy for \$.05 and sell for \$.08?
15. If you buy for \$.06 and sell for \$.07?
16. If you buy for \$.06 and sell for \$.08?
17. If you buy for \$.06 and sell for \$.09?
18. If you buy for \$.06 and sell for \$.05?
19. If you buy for \$.08 and sell for \$.11?
20. If you buy for \$.08 and sell for \$.05?
21. If you buy for \$.08 and sell for \$.13?
22. If you buy for \$.08 and sell for \$.15?

LESSON XX.

What is the gain or loss per cent :

1. If you buy for \$.06 and sell for \$.10 ?
 2. If you buy for \$.07 and sell for \$.12 ?
 3. If you buy for \$.10 and sell for \$.13 ?
 4. If you buy for \$.12 and sell for \$.15 ?
 5. If you buy for \$.13 and sell for \$.09 ?
 6. If you buy for \$.11 and sell for \$.09 ?
 7. If you buy for \$.13 and sell for \$.14 ?
 8. If you buy for \$.16 and sell for \$.19 ?
 9. If you buy for \$.16 and sell for \$.11 ?
10. Suppose that several articles, costing \$.12 apiece, are sold for \$.08, \$.09, \$.10, \$.15, \$.16, \$.18, and \$.20 respectively. What is the gain or loss per cent on each article ?
11. Articles that cost \$.16 each were sold for \$.19, \$.20, \$.21, and \$.22 respectively. What was the gain per cent on each article ?
12. Goods that cost \$.16 per yard were sold at different times for \$.14, \$.12, and \$.10 per yard. What was the loss per cent on each sale ?
13. Goods that cost \$.25 per yard were sold for \$.30 per yard. What was the gain per cent ?
14. Suppose 5 articles cost \$.10 each and are sold for \$.11, \$.12, \$.13, \$.14, and \$.15 respectively. What is the gain per cent on each sale ?
15. A dealer bought 6 desks for \$12 each, and sold them respectively for \$13, \$14, \$15, \$16, \$12, and \$11 each. What was his gain or loss per cent on each sale ?
16. Goods that cost \$.12 a yard were sold at different times for \$.13, \$.14, \$.15, and \$.17 per yard. What was the gain per cent on each sale ?

LESSON XXI.

1. If you buy at the rate of 2 for a cent and sell for a cent apiece, what is the gain per cent?

2. If you buy at the rate of 2 for \$.03 and sell at the rate of 2 for \$.05, what is the gain per cent?

3. If you buy at the rate of 3 for \$.02 and sell at the rate of 3 for \$.05, what is the gain per cent?

4. If you buy papers at the rate of 5 for \$.03 and sell them for a cent apiece, what is the gain per cent?

5. If you buy 5 papers for \$.08 and sell them at \$.02 apiece, what is the gain per cent?

6. If you buy papers at the rate of 6 for \$.21 and sell at \$.05 apiece, what is the gain per cent?

What is the gain or loss per cent:

7. If you buy for $\$ \frac{1}{3}$ and sell for $\$ \frac{1}{2}$?

8. If you buy for $\$ \frac{1}{3}$ and sell for $\$ \frac{1}{4}$?

9. If you buy for $\$ \frac{3}{8}$ and sell for $\$ \frac{1}{2}$?

10. If you buy for $\$ \frac{1}{4}$ and sell for $\$ \frac{1}{3}$?

11. If you buy for $\$ \frac{3}{4}$ and sell for $\$ \frac{5}{8}$?

12. If you buy for $\$ \frac{8}{9}$ and sell for $\$.37\frac{1}{2}$?

13. If you buy for $\$ \frac{7}{12}$ and sell for \$50?

14. If you buy for $\$ \frac{7}{8}$ and sell for \$.75?

15. If you buy for $\$.02\frac{1}{2}$ and sell for $\$.07\frac{1}{2}$?

16. If you buy for $\$.08\frac{1}{4}$ and sell for $\$.12\frac{1}{2}$?

17. If you buy for $\$ \frac{1}{4}$ and sell for $\$ \frac{1}{3}$?

18. If you buy for $\$ \frac{1}{3}$ and sell for $\$ \frac{1}{4}$?

19. If you buy for $\$ \frac{3}{8}$ and sell for $\$ \frac{5}{8}$?

20. If you buy for \$5 and sell for \$4.50?

21. If you buy for \$6 and sell for \$5.50?

22. If you buy for \$3.75 and sell for \$4?

23. If you buy for \$2.25 and sell for \$3?

24. If you buy for \$2.75 and sell for \$3.50?

LESSON XXII.

1. If coal that cost \$5 a ton is sold for \$6, what is the gain per cent?
2. If coal that cost \$6 a ton is sold for \$5, what is the loss per cent?
3. If coal that cost \$3.50 a ton is sold for \$5, what is the gain per cent?
4. If wood that cost \$5 a cord is sold for \$8 a cord, what is the gain per cent?
5. A chair that cost the dealer \$32 was sold by him for \$40. What was the gain per cent?
6. Land that cost \$35 an acre sold for \$60 an acre. What was the per cent of profit?
7. Land that cost \$40 an acre sold for \$75. What was the per cent of gain?
8. Land that cost \$60 an acre sold at \$100 an acre. What was the per cent of advance in price?
9. A lot that cost \$1200 was sold for \$1500. What was the per cent of profit?
10. A horse that cost \$300 was sold for \$450. What was the per cent of gain?
11. Merchandise that cost \$30 was sold for \$37.50. What was the gain per cent?
12. If sheep that cost \$2.50 a head are sold for \$1.75, what is the per cent of loss?
13. Goods bought for \$28 and sold for \$35 yield what per cent of profit?
14. What is the per cent of gain on an article sold at twice its cost.
15. What per cent of loss is sustained in selling goods at .7 of their cost?
16. What per cent of gain is realized in selling goods at $133\frac{1}{3}\%$ of their cost?

LESSON XXIII.

1. For what should fruit that cost \$.50 be sold to realize a profit of 10%?

2. Goods that cost \$.60 a yard are sold at a gain of 25%. Find the selling price.

3. An article that costs \$96 sold at a profit of $16\frac{2}{3}\%$. For what price did it sell?

4. At what price must a carriage be sold to gain $33\frac{1}{3}\%$ on a cost of \$150?

5. What was the selling price of goods that cost \$32, if they were sold at a gain of $12\frac{1}{2}\%$?

6. What must goods that cost \$36 sell for, so that a profit of $83\frac{1}{3}\%$ may be made?

7. Some damaged goods were sold at a loss of $66\frac{2}{3}\%$. What was the amount of the loss on \$20 worth of the goods?

8. Cloth that cost \$15 was sold at a profit of $12\frac{1}{2}\%$. Find the gain and the selling price.

9. What must be the marked price of goods that cost \$12, in order to make a profit on them of $16\frac{2}{3}\%$?

10. How should goods that cost \$96 be marked, so that a profit of $6\frac{1}{4}\%$ may be gained?

11. At what price do goods that cost \$75 sell, if the selling price is 15% less than cost?

12. How should goods that cost $\$ \frac{3}{4}$ a yard be marked to gain 60% on the cost?

13. Goods that cost $\$ \frac{1}{4}$ a yard are marked to sell at a gain of 50%. What is the selling price of the goods?

14. What must coffee that cost \$.28 a pound be sold for, to realize a profit of $16\frac{2}{3}\%$?

15. A lot that cost \$1800 sold at an advance of $66\frac{2}{3}\%$. What part of the cost was the gain?

16. In the last problem, what is the relation of the selling price to the cost? Of the selling price to the gain?

LESSON XXIV.

1. A jeweler sold a watch for \$ 25 and thereby gained 25% on the cost. What was the cost of the watch?

SUGGESTION. — \$25 is $\frac{1}{4}$ of the cost. Why?

2. If a dealer sold goods for \$ 14 and thereby realized a gain of 40%, what was the cost of the goods?

3. A coat was sold for \$ 14, which was 30% less than cost. What was the cost of the coat?

4. If by selling goods for \$ 42 a profit of $16\frac{2}{3}\%$ will be realized, what is the cost of the goods?

5. If by selling goods for \$ 60 a gain of 20% will be realized, what is the cost?

6. If by selling goods for \$ 42 a loss of $33\frac{1}{3}\%$ will be incurred, what is the cost?

7. If by selling potatoes at \$.24 a peck a grocer makes a profit of 20%, what was the cost per bushel?

8. What would be the grocer's profit on the sale of 25 bushels?

9. A farmer sold 2 cows at \$ 30 each. He gained 25% on one and lost $16\frac{2}{3}\%$ on the other. How much did he gain or lose by the sale?

10. A man sold some goods for \$ 75, thereby losing $\frac{1}{3}$ of the cost. At what selling price would he have realized a profit of $16\frac{2}{3}\%$?

11. Cloth was sold for \$ 44, at a loss of $8\frac{1}{3}\%$ on the cost. What was the cost?

12. I sold 2 cows for \$ 55 each, gaining 10% on one and losing $8\frac{1}{3}\%$ on the other. What was the gain or loss on the whole sale?

13. If by selling an article for \$ 1.40, $\frac{1}{3}$ of the cost is lost, what was the cost?

14. If by selling 8 sheep for \$ 60, a profit of 25% is made on the cost, what was the cost a head?

LESSON XXV.

1. A grain dealer sold corn at a profit of \$.12 a bushel and thereby gained 30% on the cost. What was the cost, and what the selling price, of the corn per bushel?

SUGGESTION. — \$.12 is $\frac{1}{5}$ of the cost; therefore the cost is $\frac{1}{3}$ of \$.12.

2. He sold oats at a profit of \$.07 $\frac{1}{2}$ a bushel, which was an advance of 12 $\frac{1}{2}$ % on the cost. Find the cost and the selling price of the oats.

3. He sold wheat at a profit of \$.15 a bushel, which was a gain of 25% on the cost. Find the cost and the selling price of the wheat.

4. A farmer sold his land for \$40 an acre more than it cost him, thus gaining 62 $\frac{1}{2}$ % on the cost. What was the cost, and what the selling price, of his land?

5. By selling goods for \$12 more than cost, a gain of 66 $\frac{2}{3}$ % was realized. Find the cost and the selling price.

6. By selling flour for \$1.10 less than cost, a merchant loses 20% on the cost. Find the cost and the selling price.

7. A gain of \$2.70 is 9% of the cost of some merchandise. What must be the selling price to make a gain of 16 $\frac{2}{3}$ %?

8. A gain of \$3.85 is 11% of the cost of a bookcase. What must be the selling price if a gain of 20% is to be made?

9. A profit of 33 $\frac{1}{3}$ % was made by selling a horse for \$50 more than cost. Had the horse been sold for \$100, what per cent would have been lost or gained?

10. By selling apples at \$.75 a barrel more than cost, a gain of 15% is made. If sold at \$6 a barrel, what per cent would be made?

11. By selling his house for \$1500 more than it cost him, a man realized a profit of 62 $\frac{1}{2}$ %. Find the cost and the selling price.

LESSON XXVI.

1. If $\frac{3}{4}$ of a farm sells for what the farm cost, what is the gain per cent?
2. If a farm sells for $\frac{1}{8}$ of its cost, what is the loss per cent?
3. If $\frac{5}{8}$ of a ton of coal sells for the cost of a ton, what is the gain per cent?
4. A farmer sold 350 bushels of wheat, which was $87\frac{1}{2}\%$ of his crop. How much is the remainder worth at \$.60 a bushel?
5. A man, after paying 70% of his debts, found that he still owed \$360. What was the amount of his debts?
6. If, by selling papers at \$.05 a piece, you make a profit of 60%, what was the cost of the papers?
7. A dealer sold a horse for $\frac{2}{3}$ of the cost. What was the gain per cent?
8. A dealer had 1500 ft. of lumber after disposing of $37\frac{1}{2}\%$ of his stock. What was the original amount of his stock?
9. A farm rents for \$500 a year, which is $6\frac{1}{4}\%$ of what the farm cost at \$40 an acre. How large is the farm?
10. A man pays \$400 a year for the use of 100 acres of land, which is 8% of its valuation. How much is the land worth per acre?
11. A farmer sold a cow that cost \$20 for \$18. What was the loss per cent?
12. If by selling wheat for \$16 more than cost, a merchant makes a profit of $12\frac{1}{2}\%$, what was the cost of the wheat?
13. From a farm of 200 acres 75 acres were sold. What per cent of the farm remained unsold?
14. When the gain equals $\frac{2}{3}$ of the cost, what is the gain per cent?

LESSON XXVII.

1. What is 5% of \$100? Of \$200? Of \$300? Of \$500? Of \$50? Of \$5?

2. What is the interest of \$100 at 5% per annum?

SOLUTION.—By 5% *interest* is meant “.05 of any given sum of money, for the use of which interest is paid.” *Per annum* here means “for one year.”¹ As .05 of \$100 is \$5, so 5% interest of \$100 for one year is \$5.

3. Since the interest of \$100 at 5% for one year is \$5, what is the interest for 2 years? For 3 years? For 4 years? For 10 years?

4. What per cent of the principal is 2 years' interest? 3 years' interest? 5 years' interest?

5. If the interest on a sum of money for a year is \$5, what is the interest for 6 mo.? For 3 mo.? For 9 mo.?

6. What per cent of the principal is 5% interest for 1 yr. 6 mo.? For 2 yrs. 6 mo.?

7. What is the interest of \$200 for 1 yr. 6 mo. at 5%?

8. What is the interest of \$50 for one year at 6%? For \$500? For \$150? For \$300?

9. What is the interest of \$100 for 1 yr. 6 mo. at 6%? For 2 yr. 6 mo.? For 3 yr. 6 mo.?

10. What per cent of the principal is 6% interest for 1 yr. 6 mo.? For 2 yr.? For 2 yr. 6 mo.?

11. What is the interest at 7% of \$300 for 2 yr.? For 2 yr. 6 mo.?

12. What per cent of the principal is 7% interest for 1 yr. 6 mo.? For 2 yr.? For 3 yr.? For 4 yr. 6 mo.?

13. What is the interest of \$120 for one year at 8%? For 1 yr. 6 mo.? For 2 yr. 6 mo.?

¹ Unless it is specially noted that the per cent of interest is for some other time than a year, *per annum* is understood, even when the words are omitted.

LESSON XXVIII.

1. If \$12 is the interest of a given sum of money, for a year, what is the interest for 10 mo.? For 14 mo.? For 8 mo.? For 16 mo.?

2. What part of a year is 11 mo.? 10 mo.? 9 mo.? 8 mo.? 6 mo.? 4 mo.?

3. If \$15 is a year's interest on a certain amount, what is the interest for 6 mo.? For 9 mo.? For 3 mo.?

4. If \$20 is the interest of a sum of money for 10 mo., what is one month's interest? 2 months' interest? 3 months' interest? 4 months' interest? 5 months' interest? 6 months' interest?

5. A year's interest is \$18. What is 14 months' interest? 15 months' interest? 16 months' interest?

SUGGESTION.—The relation of 14, 15, and 16 months to 12 months is $\frac{7}{6}$, $\frac{5}{4}$, and $\frac{4}{3}$ respectively.

In computing interest for months, the relation of the time in months to 12 months and 10 months should receive careful attention and treatment.

6. Given the interest for a year, how can the interest for 2 mo. be found? For 3 mo.? For 4 mo.?

7. Given the interest for 5 mo., how can the interest for 1 mo. be found? For 2 mo.? For 3 mo.? For 7 mo.?

8. Given the interest for 10 mo., how can the interest for any time expressed in months be found?

9. At 5%, what is the interest of \$10 for 1 yr. 3 mo.? For 1 yr. 4 mo.? For 1 yr. 8 mo.?

10. At 6%, what is the interest of \$30 for 10 months? For 1 mo.? For 3 mo.? For 7 mo.?

11. At 7%, what is the interest of \$40 for 1 yr. 2 mo.? For 2 yr. 3 mo.? For 3 yr. 4 mo.?

12. At 10%, what is the interest of \$60 for 1 yr. 10 mo.? For 1 yr. 5 mo.? For 2 yr. 3 mo.?

LESSON XXIX.

1. At 6%, what is the interest of \$1 for 1 yr. ? For 2 yr. ? For 3 yr. ? For 4 yr. ?

2. At 6%, what is the interest of \$10 for 12 mo. ? For 10 mo. ? For 8 mo. ? For 6 mo. ? For 4 mo. ? For 2 mo. ?

3. At 6%, what is the interest of \$12 for 10 mo. ? For 1 mo. ? For 3 mo. ? For 5 mo. ? For 7 mo. ? For 9 mo. ? For 11 mo. ?

4. At 6%, what is the interest of \$1 for 15 mo. ? For 13 mo. ? For 11 mo. ? For 7 mo. ? For 1 mo. ?

5. Since the interest of \$1, at 6%, for one month, or 30 days, is 5 mills, what is the interest for 6 da. ? For 12 da. ? For 18 da. ? For 24 da. ?

6. At 6%, what is the interest of \$1 for 1 mo. 6 da. ? For 2 mo. 12 da. ? For 3 mo. 18 da. ? For 5 mo. 24 da. ?

7. At 6%, what is the interest of \$50 for 1 yr. 7 mo. 24 da. ?

8. What is the relation of 6% interest to 7% interest ? To 8% interest ? To 9% interest ? To 10% interest ?

9. What part of 6% interest is 1% interest ? 2% interest ? 3% interest ? 4% interest ? 5% interest ?

10. What per cent interest does 6% interest increased by $\frac{1}{3}$ of itself equal ?

11. What per cent interest does 6% interest diminished by $\frac{1}{3}$ of itself equal ?

12. The interest of a certain principal computed at 6% is \$36. What would be the interest if computed at 5% ? At 7% ? At 4% ? At 8% ? At 3% ? At 9% ? At 10% ?

13. If \$120 is 6% interest on a certain sum, what would the interest be at 5% ? At 10% ?

14. If \$18 is the interest, at 6%, on a certain sum of money, what would be the interest on the same sum at 3% ? At 9% ? At 12% ?

LESSON XXX.

What is the interest of :

- | | |
|--|------------------------------------|
| 1. \$ 1 for 2 yr. at 4%? | 11. \$ 12 for 2 yr. 8 mo. at 8%? |
| 2. \$ 2 for 3 yr. at 5%? | 12. \$ 11 for 1 yr. 4 mo. at 9%? |
| 3. \$ 3 for 8 mo. at 6%? | 13. \$ 10 for 3 yr. 10 mo. at 5%? |
| 4. \$ 4 for 10 mo. at 7%? | 14. \$ 20 for 3 yr. 7 mo. at 7%? |
| 5. \$ 6 for 4 mo. at 8%? | 15. \$ 30 for 4 yr. 5 mo. at 10%? |
| 6. \$ 7 for 15 mo. at 9%? | 16. \$ 40 for 2 yr. 3 mo. at 4%? |
| 7. \$ 10 for 10 yr. at 10%? | 17. \$ 50 for 1 yr. 9 mo. at 6%? |
| 8. \$ 5 for 2 yr. at $3\frac{1}{2}$ %? | 18. \$ 60 for 1 yr. 4 mo. at 8%? |
| 9. \$ 8 for 3 mo. at 6%? | 19. \$ 80 for 3 yr. 5 mo. at 3%? |
| 10. \$ 10 for 2 yr. at $4\frac{1}{2}$ %? | 20. \$ 100 for 8 mo. 24 da. at 6%? |

At 6% interest, what is the amount¹ of :

- | | |
|------------------------------|-------------------------------------|
| 21. \$ 1 for 1 yr. 11 mo. ? | 31. \$ 100 for 1 yr. 6 mo. 12 da. ? |
| 22. \$ 2 for 10 mo. 6 da. ? | 32. \$ 200 for 2 yr. 9 mo. ? |
| 23. \$ 3 for 8 mo. 12 da. ? | 33. \$ 300 for 1 yr. 5 mo. 6 da. ? |
| 24. \$ 4 for 7 mo. 18 da. ? | 34. \$ 400 for 3 yr. 2 mo. 18 da. ? |
| 25. \$ 5 for 6 mo. 24 da. ? | 35. \$ 500 for 2 yr. 6 mo. 6 da. ? |
| 26. \$ 6 for 3 yr. 3 mo. ? | 36. \$ 600 for 2 yr. 7 mo. ? |
| 27. \$ 7 for 2 yr. 9 mo. ? | 37. \$ 700 for 3 yr. 3 mo. ? |
| 28. \$ 8 for 1 mo. 24 da. ? | 38. \$ 800 for 9 mo. 18 da. ? |
| 29. \$ 9 for 2 mo. 18 da. ? | 39. \$ 900 for 5 mo. 24 da. ? |
| 30. \$ 10 for 2 yr. 24 da. ? | 40. \$ 1000 for 2 yr. 11 mo. ? |

At 6%, what is the interest of :

41. \$ 10 for 3 yr. 6 mo. ? Find interest also at 8%.
42. \$ 12 for 2 yr. 8 mo. ? Find interest also at 5%.
43. \$ 5 for 1 yr. 9 mo. ? Find interest also at 4%.
44. \$ 15 for 2 yr. 6 mo. ? Find interest also at 9%.
45. \$ 1 for 6 yr. 6 mo. 6 da. ? Find interest also at 8%.
46. \$ 100 for 2 yr. 2 mo. 12 da. ? Find interest also at 5%.

¹ By amount is meant the sum of the principal and interest.

LESSON XXXI.

What principal will earn :

- | | |
|-------------------------------|-----------------------------------|
| 1. \$ 30 in 5 yr., at 6% ? | 11. \$8.40 in 14 mo., at 6% ? |
| 2. \$ 16 in 2 yr., at 4% ? | 12. \$ 8.40 in 12 mo., at 7% ? |
| 3. \$ 30 in 4 yr., at 5% ? | 13. \$ 48 in 2 yr. 8 mo., at 6% ? |
| 4. \$ 25.20 in 7 yr., at 3% ? | 14. \$ 48 in 2 yr., at 8% ? |
| 5. \$ 60 in 6 yr., at 5% ? | 15. \$ 100 in 3 yr., at 6% ? |
| 6. \$ 12 in 8 yr., at 6% ? | 16. \$ 100 in 2 yr., at 10% ? |
| 7. \$ 70 in 7 yr., at 4% ? | 17. \$ 4.50 in 2 mo., at 6% ? |
| 8. \$ 60 in 8 yr., at 5% ? | 18. \$ 15 in 4 mo., at 6% ? |
| 9. \$ 63 in 3 yr., at 7% ? | 19. \$ 9 in 8 mo., at 6% ? |
| 10. \$ 48 in 5 yr., at 8% ? | 20. \$ 2.50 in 10 mo., at 6% ? |

In what time will :

21. \$ 10 earn \$ 2 interest, at 10% ?
22. \$ 20 earn \$ 4 interest, at 8% ?
23. \$ 30 earn \$ 8.40 interest, at 7% ?
24. \$ 40 earn \$ 10 interest, at 5% ?
25. \$ 50 earn \$ 18 interest, at 6% ?
26. \$ 60 earn \$ 9 interest, at 3% ?
27. \$ 70 earn \$ 12.60 interest, at 9% ?
28. \$ 80 earn \$ 40 interest, at 10% ?
29. \$ 90 earn \$ 16.20 interest, at $4\frac{1}{2}$ % ?
30. \$ 100 earn \$ 25 interest, at 6% ?

At what rate per cent will :

31. \$ 100 earn \$ 24 interest, in 4 years ?
32. \$ 100 earn \$ 24 interest, in 8 years ?
33. \$ 100 earn \$ 24 interest, in 2 years ?
34. \$ 200 earn \$ 60 interest, in 6 years ?
35. \$ 200 earn \$ 60 interest, in 3 years ?
36. \$ 300 earn \$ 84 interest, in 4 years ?
37. \$ 400 earn \$ 128 interest, in 4 years ?

LESSON XXXII.

1. At 6%, what is the interest of \$ 100 for 60 da. ?
For 30 da. ? For 3 da. ?

SUGGESTION. — Observe that the interest for 60 da. is 1% of the principal, or \$1. 30 da. are $\frac{1}{2}$ of 60 da., and 3 da. are $\frac{1}{20}$ of 60 da.

2. At 6%, what is the interest of \$ 200 for 60 days plus 30 days plus 3 days ?

3. At 6%, what is the interest of \$ 300 for 30 da. plus 15 da. plus 3 da. ?

4. At 6%, what is the interest of \$ 500 for 60 da. plus 60 da. plus 3 da. ?

5. How can the interest in the last problem be changed to interest at 5% ? At 7% ? At 8% ?

6. What is the bank discount of \$ 400 for 60 da. at 6% ?

NOTE. — Banks loan money on short time, usually for 30, 60, or 90 days. Bank discount is the interest the bank pays itself when the money is loaned. In banking, 3 days of grace are added to the time of the note. Hence, the bank discount of \$ 400 for 60 days is \$ 4.20, the interest of \$ 400 for 63 days.

7. Since the bank discount of \$ 400 for 60 da. at 6% is \$ 4.20, what would be the bank discount of the same amount at 5% ? At 7% ? At 4% ? At 8% ?

8. What is the bank discount of \$ 240 for 90 da. at 6% ? At 5% ? At 7% ?

ANALYSIS. — For 60 da. the discount at 6% is \$ 2.40; for 30 da., \$ 1.20; for 3 da., \$.12. Hence, for 93 da. the discount at 6% is \$ 3.72. Subtracting $\frac{1}{2}$ of this amount from itself, we get \$ 3.10, the interest at 5%, etc.

9. What is the bank discount of \$ 640. for 60 days at 6% ? At 9% ?

10. What is the bank discount of \$ 720 for 60 days at 6% ? For 90 days at 8% ? For 30 days at 5% ?

LESSON XXXIII.

1. Recite the squares of the numbers from 1 to 15.
2. What is the square of: $1\frac{1}{2}$? $2\frac{1}{2}$? $3\frac{1}{2}$? $4\frac{1}{2}$? $5\frac{1}{2}$?
3. What is the square of: $3\frac{3}{8}$? $6\frac{3}{8}$? $8\frac{3}{8}$? $12\frac{3}{8}$? $16\frac{3}{8}$?
4. What is the square of: 1.5? 2.5? 3.5? 4.5? 5.5?

NOTE.—These squares (2.25, 6.25, 12.25, 20.25, 30.25) may be easily memorized with the help of a little observation. It will be observed that the decimal part of the squares is .25 (or the square of the decimal in the root), and that the integral part of the squares is the product of the integer in the root and the next larger integer.

5. What is the square of: 6.5? 7.5? 8.5? 9.5?
10.5? 11.5? 12.5?

6. What is the square of: $\frac{1}{2}$? $\frac{3}{4}$? $\frac{1}{4}$? $\frac{1}{8}$? $\frac{1}{16}$? $\frac{1}{9}$?

7. What is the square of: .1? .2? .3? .4? .5?
.6? .7? .8? .9? 1.0? 1.1? 1.2?

8. What are the units of measurement in square measure?

9. How many square inches make a square foot? Why?

10. What part of a square foot is a surface 8 in. by 9 in.?

11. What is the relation of a chessboard 15 in. square to a square foot?

12. How many square feet are there in a square yard?
Why?

13. What part of a square yard of surface is covered by a rug 3 ft. long and 2 ft. wide?

14. How much surface expressed in square feet is covered by a roll of paper 20 ft. long and 18 in. wide?

15. How many square yards are there in a square rod?
Why?

16. How many square feet are there in a square rod?
Why?

17. What is meant by an acre? By a square mile?
By a mile square?

LESSON XXXIV.

1. What part of an acre is a lot 8 rd. long and 4 rd. wide?
2. How many acres are there in a field 40 rd. square?
3. How many rods are there in $\frac{5}{8}$ A.?
4. What part of an acre is 40 sq. rd.? 60 sq. rd.? 100 sq. rd.?
5. What part of an acre is a city lot having a frontage of 33 ft. and a depth of 132 ft.?
6. How many such lots can be laid out from an acre of land?
7. If the owner of the lots paid \$2000 an acre for the land, how much did the lots cost him apiece?
8. If he should sell the lots for \$500 each, what per cent of profit would he make?
9. What would be his entire gain in such a transaction?
10. If \$800 is the price paid for a lot 40 ft. square, what is the price per front foot? (That is, what is the price for a strip with a frontage 1 ft. wide and a depth of 40 ft.?)
11. What is the average price per square foot of the above-mentioned lot?
12. What is the area of a floor 5 yards square?
13. What is the area in square yards of a floor $16\frac{1}{2}$ ft. long by 11 ft. wide?
14. What is the area in square yards of a hall floor 66 ft. long by 33 ft. wide?
15. My garden fence incloses $1\frac{1}{4}$ A. The garden is 20 rd. long. How many rods of fence are there?
16. What would it cost to cement a cellar 30 ft. by 18 ft. at $\$ \frac{2}{3}$ a sq. yd.?
17. A ceiling is 24 ft. by 18 ft. What would it cost to paint it at \$.50 a square yard?

LESSON XXXV.

1. How many breadths of carpet would be needed for a room 15 ft. wide?

NOTE. — Carpet is a yard wide unless otherwise specified.

2. How many breadths of carpet would be required for a room 17 ft. wide? How much of one breadth would turn under in the laying?

3. A room is 23 ft. long and 16 ft. wide. How many breadths of carpet are needed, if it is cut lengthwise of the room? If it is cut crosswise of the room?

4. If cut lengthwise, how much carpet would turn under in laying? How much, if cut crosswise?

5. If cut lengthwise, how many yards are required to cover the room? How many yards, if cut crosswise?

6. How many breadths of carpet $\frac{2}{3}$ yd. wide are needed for 12 ft. of floor space? For 16 ft.? For 24 ft.?

7. A floor is 27 ft. by 21 ft. What part of its surface would a breadth of carpet cut lengthwise of the room cover?

8. What part of the floor would be covered by a breadth of carpet cut crosswise?

9. How many yards of carpet would cover the floor?

10. What would it cost to carpet the room at \$ $\frac{7}{8}$ a yard for the carpet, and \$.12 $\frac{1}{2}$ a yard for laying?

11. How much wall space will a roll of paper cover that is 24 ft. long and 18 in. wide?

12. If the average width of shingles is 4 in., and they are laid 4 in. to the weather, how much surface will one shingle cover?

13. How many shingles are there to the square foot?

14. Taking the carpenter's estimate of 10 shingles to the square foot, how many shingles will lay 100 sq. ft. of roof?

LESSON XXXVI.

1. Recite the cubes of numbers from 1 to 12.
2. What is the cube of: $\frac{1}{2}$? $\frac{1}{3}$? $\frac{1}{4}$? $\frac{1}{5}$? $\frac{1}{6}$?
3. What is the cube of: .1? .2? .3? .4? .5? .6?
4. What are the units of measurement in cubic measure?
5. How many cubic inches are there in a cubic foot?
Why?
6. How many cubic feet are there in a cubic yard?
Why?
7. How many cubic inches are there in a 2-inch cube?
In a 3-inch cube? In a 4-inch cube? In a 5-inch cube?
8. How many cubic inches are there in a block 12 inches long, 12 inches wide, and 12 inches thick?
9. What is the relation of the square of 1 to the square of 2? Of the square of 2 to the square of 3?
10. What is the relation of 3 to the square of 3? Of 3 to the cube of 3?
11. What is the relation of 12 to 12^2 ? Of 12 to 12^3 ?
Of 12^2 to 12^3 ?
12. How much space does a box 3 ft. long, 3 ft. wide, and 3 ft. high occupy?
13. Give the dimensions of a box that would occupy $\frac{1}{8}$ of the space. Of one that would occupy twice the space.
14. How much space would a block 5 ft. square at the base and 3 ft. high occupy?
15. Find the contents of a block of stone 10 ft. long, 6 ft. wide, and 18 in. thick?
16. What is the volume of a solid 6 yd. long, 4 yd. wide, and 3 ft. thick?
17. What is the volume of a cube whose edges measure 5 in.?
18. What is the relation of a 2-inch cube to a 5-inch cube? To a 7-inch cube?

LESSON XXXVII.

1. What is the unit in Wood Measure?
 2. How many cubic feet are there in a pile of wood 8 ft. long, 4 ft. wide, and 4 ft. high? How many cubic feet are there in a cord?
 3. One foot in length of such a pile is called a *cord foot*. What part of a cord is a cord foot? How many cord feet make a cord?
 4. Since a cord foot is $\frac{1}{4}$ of a cord, how many cubic feet are there in a cord foot?
 5. How many cord feet are there in 48 cu. ft.? What part of a cord is 48 cu. ft.?
 6. How many cord feet are there in $\frac{5}{8}$ of a cord? How many cubic feet?
 7. Give the possible dimensions, in two different ways, of a pile of wood containing 2 cords? Of one containing 4 cords? Of one containing 5 cords?
 8. What is the unit in Board Measure? What is a board foot? How many board feet make one cubic foot?
 9. A board 6 ft. long, a foot wide, and an inch thick is what part of a cubic foot? A board 4 ft. long? A board 9 ft. long? A board 10 ft long?
 10. Since a board 12 ft. long and 12 in. wide equals a cubic foot, what would a board 16 feet long equal?
 11. A board 16 feet long must be of what width to be equal to an even cubic foot?
- ANALYSIS. — Since a board 16 ft. long and 12 in. wide is $\frac{4}{3}$ of a cu. ft., a board $\frac{3}{4}$ of the width would be equal to an even foot.
12. How much lumber is there in two 12-foot boards, 9 in. wide, and in two 10-foot boards, 8 in. wide?
 13. How many cubic feet are there in ten planks 2 in. thick, 12 ft. long, and 1 ft. wide?

LESSON XXXVIII.

1. What is the unit in Liquid Measure, and what is its capacity in cubic inches?
2. What is the unit in Dry Measure, and what is its capacity in cubic inches?
3. The capacity of $7\frac{1}{2}$ gallons is one cubic foot. What is the capacity of a 15-gallon can of water?
4. A cubic foot of water weighs $62\frac{1}{2}$ pounds. What is the weight of a 15-gallon can of water?
5. How many cubic feet of water are there in three 10-gal. cans of water?
6. If a man drinks half of a gallon of water a day, in what time will he drink a cubic foot of water?
7. What is the capacity in cubic feet of a cask holding 45 gal.? Of one holding 30 gal.? Of one holding 40 gal.?
8. Since 4 bu. of grain occupy 5 cu. ft. of space, what space will 8 bu. occupy? 12 bu.? 16 bu.? 20 bu.?
9. Reduce to bushels: 10 cu. ft. 15 cu. ft. 25 cu. ft. 60 cu. ft. 100 cu. ft.
10. What is the holding capacity in bushels of a box 5 ft. long, 3 ft. wide, and 2 ft. high?
11. How much space is required to hold 100 bu. of corn? 200 bu. of oats? 300 bu. of wheat?

Reduce :

12. 60 cu. ft. to gallons. 60 gal. to cubic feet.
13. 60 cu. ft. to bushels. 60 bu. to cubic feet.
14. 10 cu. ft. of water to pounds.
15. 1 qt. (liquid) to cubic inches.
16. 1 qt. (dry) to cubic inches.
17. A space 5 ft. by 4 ft. by 3 ft. to bushels.
18. 90 cu. ft. to bushels. 90 bu. to cubic feet.

LESSON XXXIX.

1. At the rate of 2 for \$.03, how many apples will \$.45 buy?
2. At \$.48 a dozen, how much will 10 oranges cost?
3. If 27 cans of fruit cost \$3.60, what will 9 cans cost?
4. If 15 men earn \$50, at the same rate, how much can 75 men earn?
5. At \$3.60 a dozen, what will 8 pairs of scissors cost?
6. If $\frac{3}{4}$ of a man's money is \$60, how much is $\frac{2}{3}$ of it?
7. If $\frac{3}{4}$ of the cost of an orange is $\frac{3}{4}$ of a cent, what is $\frac{5}{8}$ of the cost of the orange.
8. A man, after spending $\frac{1}{5}$ of his money, and losing $\frac{1}{5}$ of the remainder, had \$60 left. How much had he at first?
9. What is the cost of 10 dolls at \$.62 $\frac{1}{2}$ each. At \$.87 $\frac{1}{2}$ each? At \$1.66 $\frac{1}{2}$ each? At \$1.12 $\frac{1}{2}$ each?
10. What is the cost of a dozen books at \$1.25 a copy? At \$1.33 $\frac{1}{3}$ a copy? At \$1.37 $\frac{1}{2}$ a copy? At \$1.66 $\frac{2}{3}$ a copy?
11. How many yards can be bought for \$8 at \$.06 $\frac{1}{4}$ a yard? At \$.08 $\frac{1}{4}$ a yard? At \$.12 $\frac{1}{2}$ a yard? At \$.16 $\frac{3}{4}$ a yard?
12. For \$12, how many yards of cloth can be bought at \$.33 $\frac{1}{3}$ a yard? At \$.37 $\frac{1}{2}$? At \$.62 $\frac{1}{2}$? At \$.66 $\frac{2}{3}$? At \$1.16 $\frac{2}{3}$?
13. How many times 1.5 is 33? How many times 5.5? How many times 3.66 $\frac{2}{3}$?
14. How many times .3 is 12? How many times .4? How many times .6? How many times .25?
15. At the rate of \$42 for 100 pounds, what is the price of 33 $\frac{1}{3}$ lb.? Of 16 $\frac{2}{3}$ lb.? Of 66 $\frac{2}{3}$ lb.?
16. At the rate of \$4 for .66 $\frac{2}{3}$ of a cord, what will 5.5 cords of wood cost?
17. A owns .5 of a boat, B owns .37 $\frac{1}{2}$, and C owns .5 of the remainder. What part of the boat does C own?

LESSON XL.

Tell what elements can be found and the methods of finding them, the following being given :

1. Cost and selling price.
2. Cost and rate of gain.
3. Cost and rate of loss.
4. Selling price and rate of gain.
5. Selling price and gain.
6. Selling price and rate of loss.
7. Selling price and loss.
8. Gain and rate of gain.
9. Loss and rate of loss.
10. Given principal and rate. How can the interest for one year be found ?
11. Given interest for one year. How can the interest for 10 mo. be found ?
12. Given interest at 6%. How can the interest at 5% be found ? At 8% ?
13. How can the interest at 6% for 60, 30, 3 and 93 days be read at sight ?
14. Given the capacity of a vessel in gallons. How can the capacity in cubic feet be found ?
15. Given the capacity of a vessel in cubic feet. How can its capacity in gallons be found ?
16. Given the capacity of a certain space in bushels. How can its capacity in cubic feet be found ?
17. Given the cubical contents of a box. How can its capacity in bushels be found ?
18. Given the value of $12\frac{1}{2}\%$ of a quantity. How can the value of $62\frac{1}{2}\%$ of the quantity be found ?
19. Given the value of $87\frac{1}{2}\%$ of a quantity. How can the value of $\frac{5}{8}$ of the quantity be found ?

SEVENTH GRADE.

SEVENTH GRADE.

LESSON I.

1. An agent sold \$1000 worth of flour, at a commission of 2%. What was his commission?

ANALYSIS.—Since the agent's commission equals 2% of the *sale*, it equals 2% of \$1000. 2% of \$1000 equals \$20.

2. What is an agent's commission who buys \$2000 worth of wool, at a commission of $1\frac{1}{2}\%$?

ANALYSIS.—Since the agent's commission equals $1\frac{1}{2}\%$ of the *purchase*, it equals $1\frac{1}{2}\%$ of \$2000. $1\frac{1}{2}\%$ of \$2000 equals \$30.

3. A broker buys 10 shares of stock, whose par value is \$100 per share, at a brokerage of $\frac{1}{4}\%$. What is his brokerage?

NOTE.—Brokerage is always computed on the *par value* of stocks, bonds, etc., no matter what the selling price may be.

4. At $1\frac{3}{4}\%$ commission, what are the proceeds of a sale of \$1200 worth of flour?

ANALYSIS.—Since the commission equals $1\frac{3}{4}\%$ of the *sale*, it equals $1\frac{3}{4}\%$ of \$1200. $1\frac{3}{4}\%$ of \$1200 equals \$21. \$1200 less \$21 equals \$1179, the proceeds.

5. At $\frac{1}{8}\%$ brokerage, what is the broker's commission for buying at par 10 shares of stock worth \$80 a share?

6. How much will be remitted to the owner of \$1000 worth of tobacco, which has been sold at a commission of 1%?

7. A commission merchant bought for another \$2500 worth of cotton at a commission of $1\frac{1}{2}\%$. What is his commission?

LESSON II.

1. At 2% commission, an agent received \$40 for selling goods. What was the value of the sale?

ANALYSIS. — Since 2% of the sale equals \$40, 1% of it equals $\frac{1}{2}$ of \$40, or \$20, and 100% equals \$2000.

SUGGESTION. — The value of the sale equals $100\frac{1}{2}$ of \$40.

2. At $\frac{3}{4}$ % commission, an agent received \$20 for buying grain. What was the value of the grain bought?

3. At $1\frac{1}{2}$ % commission, an agent received \$35 for selling cotton. What was the value of the cotton sold?

4. An agent received \$45 for buying cattle, at a commission of $1\frac{1}{4}$ %. What was the value of the cattle bought?

5. An agent was paid \$28 for buying stock, at a commission of $\frac{1}{8}$ %. How many \$100-shares were bought?

6. An agent was paid \$64 for selling flour, at a commission of $1\frac{2}{3}$ %. At \$5 a barrel, how many barrels were sold?

7. An agent received \$66 for buying pork, at a commission of $1\frac{3}{8}$ %. At \$12 a barrel, how many barrels were bought?

8. An agent was paid \$30 for selling wool, at a commission of $2\frac{1}{2}$ %. How much did the owner of the wool receive?

9. At $2\frac{1}{4}$ % commission, an agent received \$63 for buying pork. At \$7 a barrel, how many barrels were bought?

10. At $\frac{1}{8}$ % brokerage, an agent was paid \$8 for buying 64 shares of stock at par. What was the value per share?

11. An agent was paid \$84 for selling lard, at a commission of $1\frac{1}{4}$ %. At \$8 a barrel, how many barrels were sold?

12. An agent was paid \$99 for buying wool, at 3% commission. If the wool was bought at \$.33 a pound, how many pounds were bought?

LESSON III.

1. At 2% insurance, what is the annual premium for insuring property to the value of \$1500?

2. What is the annual premium for insuring household furniture to the extent of \$2000, at $1\frac{1}{4}\%$?

3. What is the annual premium for insuring a house to the value of \$2500, at $1\frac{1}{2}\%$?

4. At $\frac{3}{4}\%$ insurance, what is the annual premium for insuring a horse and carriage to the value of \$1200?

5. A stock of goods is valued at \$2500. What is the annual cost of insuring $\frac{2}{3}$ of the same at $\frac{4}{5}\%$?

6. At $1\frac{1}{2}\%$ insurance, what is the annual cost of insuring a dwelling house to the value of \$3600?

7. The premium annually paid for insuring household furniture at $1\frac{1}{4}\%$ is \$20. What is the amount of the insurance?

8. At $\frac{7}{8}\%$ annually, what is the cost of insuring for 3 years, property to the value of \$4000?

9. The amount paid annually for insuring household goods at $\frac{5}{8}\%$ was \$15. What was the amount of insurance?

10. At $\frac{3}{4}\%$ insurance, \$12 was paid annually as a premium on the insurance of furniture. What was the amount of insurance?

11. At $1\frac{1}{2}\%$ insurance, what is the premium for insuring goods to the value of \$4000?

12. A premium of \$25 was paid for insuring a house, and the rate of insurance was $1\frac{1}{4}\%$. What was the amount of insurance?

13. At a rate of $\frac{7}{8}\%$, what is the premium for 4 years for the insurance of furniture valued at \$2400?

14. A premium of \$48 was paid for insuring a house for 3 years at $\frac{4}{5}\%$ insurance. What was the amount of insurance?

LESSON IV.

1. In a village in which the tax levy equals $1\frac{1}{4}\%$ of the taxable property, how much does A pay, whose property is assessed at \$1200?

2. What is B's tax, if his property is assessed at \$2800, in a town whose tax rate is $1\frac{3}{4}\%$?

3. What is a man's tax whose property is assessed at \$2500, in a district in which the tax rate is $1\frac{1}{4}\%$ of the taxable property?

4. In a district where the tax levy is $1\frac{3}{4}\%$ of the taxable property, how much is a man taxed whose property is assessed at \$3600?

5. A man owns property assessed at \$4000, in a town where the rate of tax is $1\frac{3}{8}\%$. What is the amount of his tax?

6. What is a man's tax whose property is assessed at \$4500, in a district where the rate of tax is $1\frac{1}{5}\%$?

7. If a tax of \$24 was paid upon property, in a district where the rate of taxation was $1\frac{3}{8}\%$, what was the assessed value of the property?

8. A tax of \$18 was paid upon property, where the rate of taxation was $1\frac{1}{5}\%$. What was the assessed value of the property?

9. What is a man's tax whose property is assessed at \$4800, when the rate of taxation is $1\frac{5}{8}\%$?

10. What is a man's tax whose property is assessed at \$5000, when the rate of tax is $1\frac{1}{4}\%$?

11. When the tax levy equals $2\frac{1}{4}\%$ of the taxable property, what is a man's tax whose property is assessed at \$6000?

12. A tax of \$30 is levied upon property, situated in a district when the rate of tax is $2\frac{1}{2}\%$. What is the assessed value of the property?

LESSON V.

1. What is meant by the expression "interest at 6%?"

Ans. By "interest at 6%" is meant, that the interest for 1 year equals 6% of the principal.

2. What is meant by interest at 3%? By interest at 5%?

3. What is meant by interest at 7%? By interest at 8%?

4. What is understood by interest at 9%? By interest at 10%?

5. What per cent of the principal does the interest at 6% for 2 years equal?

6. What is the percentage relation of the interest for 2 years at 5% to the principal?

7. What is the percentage relation of the interest for 3 years at 4% to the principal?

8. What is the percentage relation of the interest for 3 years at 5% to the principal?

9. What is the percentage relation of the interest for 1 yr. 6 mo. at 6% to the principal?

10. What is the percentage relation of the interest for 2 yr. 4 mo. at 6% to the principal?

11. The interest for 1 yr. 9 mo. at 4% is in what percentage relation to the principal?

12. The interest for 2 yr. 3 mo. at 8% is in what relation to the principal?

13. In what relation to the principal is the amount for 2 yr. 8 mo. at 9%? For 3 yr. 6 mo. at 8%? For 4 yr. 3 mo. at 9%?

14. In what percentage relation to the principal is the amount for 3 years 3 months at 5%?

15. In what percentage relation to the principal is the amount for 4 years 3 months at 6%?

LESSON VI.

1. What is the interest of \$200 for 2 years at 6%?

ANALYSIS.—Since the interest for 1 year equals 6% of the principal, for 2 years, it equals twice 6%, or 12% of the principal. 12% of \$200 equals \$24. Or, since the interest for 1 year equals 6% of the principal, it equals 6% of \$200 which is \$12, and for 2 years it is twice \$12, or \$24.

2. What is the interest of \$300 for 2 yr. 6 mo. at 4%?

SUGGESTION.—2 years 6 months equal $2\frac{1}{2}$ years.

3. What is the interest of \$400 for 2 yr. at 5%?
4. At 4%, what is the interest of \$500 for 2 yr.?
5. At 3%, what is the interest of \$600 for 2 yr.?
6. What is the interest of \$700 for 3 yr. at 3%?
7. What is the interest of \$800 for 3 yr. at 4%?
8. At 5%, what is the interest of \$1000 for 4 yr.?
9. What is the amount of \$200 for 1 yr. 6 mo. at 6%?
10. At 4%, what is the amount of \$300 for 2 years 6 months?
11. What is the amount of \$400 for 2 yr. 4 mo. at 3%?
12. At 4%, what is the amount of \$500 for 2 yr. 3 mo.?
13. If \$600 is used as a loan for 2 yr. 9 mo. at 4%, how much is due at the expiration of the time?
14. How much is due at the expiration of the time, if \$700 is used as a loan for 2 yr. 4 mo. at 6%?
15. A used \$800 of B's money for 3 yr. 4 mo., paying 6% interest. How much was due B at the expiration of the time?
16. Smith used \$900 of Scott's money for 2 yr. 8 mo., paying 9% interest. How much was due Scott at the expiration of the time?
17. How much will be due B at the expiration of the time, if he loans \$1000 for 3 yr. 6 mo. at 10%?

LESSON VII.

1. In what relation to the principal is the interest for 270 days at 8% per annum?

SUGGESTION. — In computing interest, 30 da. is reckoned to equal 1 mo., and 360 da. to equal 1 yr. Therefore, 270 da. equal $\frac{3}{4}$ of a year.

2. At 9% per annum, in what relation to the principal is the interest for 240 days?

3. In what relation to the principal is the interest for 210 days at 6% per annum?

4. At 12% per annum, in what relation to the principal is the interest for 180 days?

5. In what relation to the principal is the interest for 150 days at 4% per annum?

6. At 9% per annum, in what relation to the principal is the amount for 160 days?

7. In what relation to the principal is the amount for 120 days at 5% per annum?

8. At 4% per annum, in what relation to the principal is the amount for 90 days?

9. In what relation to the principal is the amount for 60 days at 6% per annum?

10. What is the interest of \$40 for 30 days, at 6% per annum?

11. At 12% per annum, what is the interest of \$50 for 60 days?

12. How much shall be paid for the use of \$60 for 90 days at 6% per annum?

13. At 3% per annum, what is the interest of \$80 for 120 days?

14. What is the interest of \$90 for 150 days at 6%?

15. What is the amount of \$120 for 160 days at 9%?

16. At 4%, what is the amount of \$150 for 180 days?

17. What is the amount of \$180 for 200 days at 3%?

LESSON VIII.

1. The sum of \$48 was paid for the loan of money for 2 years at 6%. How much money was loaned?

SUGGESTION. — Since the interest for one year equals 6% of the principal, for 2 years it equals 12% of the principal. \$48 equals 12% of how much?

2. The sum of \$50 was paid for the loan of money for 2 years at 5%. How much money was loaned?

3. How much money must be loaned for 3 years at 4%, that the interest thereof may amount to \$72?

4. How much money must be loaned for 2 years 6 months at 6%, that the interest thereof may amount to \$60?

5. If \$88 is paid for the use of money for 2 years 9 months at 4%, how much money has been loaned?

6. If \$63 was paid for the loan of money for 3 years 6 months at 6%, how much money was loaned?

7. If \$72 is the interest of a note for 60 days at 6%, what is the value of the note?

8. If the interest of a note for 90 days at 4% is \$12, what is the face of the note?

9. The sum paid for the loan of money for 120 days at 5% is \$25. How much money was loaned?

10. If \$30 is the interest of a note due in 150 days at 6%, what is the face of the note?

11. How much money must be loaned for 180 days at 5%, that the interest thereof may be \$40?

12. If the interest of a note for 1 year 90 days at 8% is \$50, how much is due at the maturity of the note?

13. If \$48 was paid for the loan of money for 1 year 120 days at 6%, what was the amount of the loan?

14. The interest of a note due in 1 year 240 days at 9% is \$60. How much will be due at the maturity of the note?

LESSON IX.

1. In what time, at 3% per annum, will the interest of \$40 equal \$1.80?

ANALYSIS. — Since the interest of \$40 for one year at 3% equals \$1.20, \$1.80, which equals $1\frac{1}{2}$ of \$1.20, equals the interest for $1\frac{1}{2}$ years, or 1 year 6 months.

2. In what time, at 4% per annum, will the interest of \$50 equal \$4?

3. In what time, at 5% per annum, will the interest of \$60 equal \$4.50?

4. In what time, at 6% per annum, will the interest of \$75 equal \$9?

5. At 7% per annum, in what time will the interest of \$80 equal \$8.40?

6. At 8% per annum, in what time will the interest of \$90 equal \$10.80?

7. At 9% per annum, in what time will the interest of \$100 equal \$22.50?

8. How long must a note of \$120 be on interest at 10%, that the interest may be \$64?

9. How long must a note of \$150 be on interest at 12%, that the interest may be \$45?

10. In what time will a note of \$160 mature, if the interest, at 5%, will be \$34 at the time of maturity?

11. For what time has a note of \$200 been given, if the interest, at 6%, is \$48 at the time of maturity?

12. If the interest, at 8%, on a note for \$250 was \$75, how long did the note run?

13. In what time will a note of \$240 mature, if the interest, at 5%, will equal the principal at the time of maturity?

14. How many years has a debt of \$300 run, if the interest at 8%, paid annually, is equal to the principal?

LESSON X.

1. At what rate of interest is \$ 7.50 the interest of \$ 50 for 2 years 6 months ?

ANALYSIS. — Since the interest at 1% for 1 year equals 1% of the principal, the interest for 2 years 6 months, or $2\frac{1}{2}$ years, equals $2\frac{1}{2}\%$ of the principal. $2\frac{1}{2}\%$ of \$ 50 equals \$ 1.25. \$ 1.25 is contained in \$ 7.50 six times. Therefore, the rate of interest is 6%.

2. If \$ 2.40 is the interest of \$ 40 for 1 year 6 months, what is the rate of interest ?

3. At what rate of interest is \$ 6 the interest of \$ 60 for 2 years ?

4. If \$ 6.30 is the interest of \$ 70 for 1 year 6 months, what is the rate of interest ?

5. At what rate of interest is \$ 7.20 the interest of \$ 80 for 2 years 3 months ?

6. If \$ 10.50 is the interest of \$ 90 for 2 years 4 months, what is the rate of interest ?

7. At what rate of interest is \$ 1 the interest of \$ 100 for 45 days ?

8. If \$ 3.60 is the interest of \$ 120 for 120 days, what is the rate of interest ?

9. What is the rate per cent per annum, if \$ 4 is the interest of \$ 150 for 5 months 10 days ?

10. At what rate of interest is \$ 19 the interest of \$ 300 for 9 months 15 days ?

11. What is the rate of interest if \$ 6.25 is the interest of \$ 250 for 5 months ?

12. If \$ 2.80 is the interest of \$ 280 for 2 months 12 days, what is the rate of interest ?

13. What is the rate of interest if \$ 50 is the interest of \$ 320 for 3 years 1 month 15 days ?

14. At what rate of interest is the interest of \$ 450 for 12 years 6 months equal to the principal ?

LESSON XI.

1. What is a *promissory note* ?

Ans. A promissory note is a written promise made by one party to pay to another party a certain sum of money, either on demand or at a specified time.

2. What is understood by the *date* of a note? The *time* to run? The *face* of a note? The *maturity* of a note? *Days of grace*? The *maker* of a note? The *payee* of a note? *Value received*?

NOTE. — Interest-bearing notes will not be considered in this discussion.

\$ 500.

CHICAGO, Sept. 1, 1894.

For value received, sixty days after date, I promise to pay to the order of Renwick Wilson, five hundred and $\frac{00}{100}$ dollars.

CHARLES SCOTT.

3. What is the *date* of the above note? What is the *time* it is to run? What is the *face* of the note? *When* does it mature? Who is the *maker* of the note? Who is the *payee*?

4. Explain the method by which the above, or any note, is discounted at a bank.

5. What is understood by bank discount at 6%?

Ans. Bank discount at 6%, simple interest, is understood to mean simple interest for one year at 6% on the face of the note. Three days of grace are always added in computation of bank discount.

6. What is understood by *term of discount*? How does it compare with *time to run*?

7. In what relation to the face of the note is the bank discount for 30 days at 6%?

ANALYSIS. — Since the bank discount for 1 year equals 6% of the face of the note, for 30 and 3 days, or 33 days, or $\frac{11}{120}$ of a year, it equals $\frac{11}{120}$ of 6%, or $\frac{11}{20}$ % of the face of the note.

LESSON XII.

1. In what relation to the face of a note is the bank discount for 45 days at 6%?

2. In what relation to the face of a note is the bank discount for 63 days at 8%?

3. The bank discount for 78 days at 5% is in what relation to the face of the note?

4. In what relation to the face of a note is the bank discount for 90 days at 8%?

5. The bank discount for 120 days at 6% is in what relation to the face of the note?

6. In what relation to the face of a note is the bank discount for 32 days at 5%?

7. In what relation to the face of a note is the bank discount from Sept. 15 to Oct. 27, at 6%?

8. What is understood by the *proceeds* of a note?

9. In what relation to the face of a note are the proceeds for 45 days at 8%?

ANALYSIS. — Since the bank discount equals $1\frac{1}{5}\%$ of the face of the note, the proceeds equal $98\frac{4}{5}\%$ of the face of the note.

10. In what relation to the face of a note are the proceeds for 30 days at 6%?

11. The proceeds of a note for 60 days at 8% are in what relation to the face of the note?

12. In what relation to the face of a note are the proceeds for 72 days at 6%?

13. What is the bank discount of a note for \$200 for 30 days at 6%?

14. What are the proceeds of a note for \$300, discounted for 60 days at 8%?

15. A note for \$600 was discounted at bank for 90 days at 10%. How much did the holder of the note receive?

16. Find the bank discount of \$500 for 60 days at 9%.

LESSON XIII.

1. What is understood by *exchange*? The *rate of exchange*? A *draft*? The *face* of a draft? Distinguish between *sight* and *time drafts*.

NOTE.—Time drafts will not be considered in this discussion.

\$ 400.

NEW YORK, Sept. 10, 1894.

For value received, at sight, pay to the order of Robert Winthrop, four hundred dollars, and charge to the account of

FIRST NATIONAL BANK.

To Union National Bank, Chicago.

2. What is the date of the above draft? When was it drawn? To whom is payment to be made? Where is it to be made?

3. What is the amount of the face of the draft? Why is it a sight draft?

4. Under what conditions is exchange at a *premium*? At a *discount*?

NOTE.—Observe the distinction between the *cost of the exchange* and the *cost of the draft*.

5. In what relation to the face of a draft is the cost of exchange at a premium of $\frac{1}{2}\%$?

SUGGESTION.—The cost of the exchange equals $\frac{1}{2}\%$ of the face of the draft.

6. In what relation to the face of the draft is the cost of the draft at a premium of $\frac{1}{2}\%$?

SUGGESTION.—The cost of the draft equals $100\frac{1}{2}\%$ of the face of the draft.

7. In what relation to the face of a draft is the cost of the exchange at a discount of $\frac{3}{8}\%$?

8. In what relation to the face of a draft is the cost of the draft at a premium of $\frac{3}{4}\%$? Prove.

LESSON XIV.

1. The cost of the exchange of a draft, at a discount of $\frac{5}{8}\%$, is in what relation to the face of the draft?

2. In what relation to the face of a draft is the cost of the draft at a discount of $\frac{7}{8}\%$?

3. In what relation to the face of a draft is the cost of the draft, at a premium of $\frac{3}{8}\%$?

4. The cost of a draft, at a discount of $1\frac{1}{4}\%$, is in what relation to the face of the draft?

5. What is the cost of a draft for \$ 300, exchange being at a premium of $\frac{1}{2}\%$?

ANALYSIS. — Since the exchange is at a premium of $\frac{1}{2}\%$, the cost of the exchange equals $\frac{1}{2}\%$ of the face of the draft. $\frac{1}{2}\%$ of \$300 equals \$1.50, and the cost of the draft equals \$300 plus \$1.50, or \$301.50.

Or, the cost of the draft equals $100\frac{1}{2}\%$ of the face of the draft. $100\frac{1}{2}\%$ of \$300 equals \$301.50.

6. What is the cost of a draft for \$ 80, exchange being at a premium of $\frac{1}{2}\%$?

7. Exchange being at a premium of $\frac{5}{8}\%$, what is the cost of the exchange of a draft for \$ 120?

8. When exchange is at a discount of $\frac{7}{8}\%$, what is the cost of a draft for \$ 160?

9. When exchange is at a premium of $\frac{3}{4}\%$, what is the cost of a draft for \$ 60?

10. What is the cost of a draft for \$ 200, when exchange is at a discount of $\frac{1}{4}\%$?

11. Exchange being at a premium of $\frac{3}{8}\%$, what is the cost of a draft for \$ 400?

12. When exchange is at a discount of $\frac{1}{4}\%$, what is the cost of a draft for \$ 240?

13. What is the cost of a draft for \$ 400, when exchange is at a discount of $\frac{1}{2}\%$? When exchange is at a discount of $\frac{3}{4}\%$?

LESSON XV.

1. What is the relation of 4 to 12?

Ans. 4 equals 8 less than 12; or, 4 equals $\frac{1}{3}$ of 12.

2. What is the relation of 20 to 4?

Ans. 20 equals 16 more than 4; or, 20 equals five 4's.

NOTE. — The latter of these relations, unless otherwise specified, is the relation understood. Hereafter the term *ratio* will be used instead of the word *relation*.

3. What is the ratio of 3 to 15? Of 4 to 20? Of 36 to 4?

4. What is the ratio of 5 to 20? Of 24 to 6? Of 48 to 8?

5. 7 is in what ratio to 56? 8 is in what ratio to 72?

6. In what ratio is 45 days to 5 days? \$63 to \$7?

7. In what ratio is 48 miles to 6 miles? \$9 to \$72?

8. What is the ratio of 12 acres to 96 acres? Of \$108 to \$12?

9. How does the ratio of 3 to 12 compare with the ratio of 5 to 20?

Ans. The ratio of 3 to 12 is equal to the ratio of 5 to 20.

10. How does the ratio of 20 to 4 compare with the ratio of 35 to 7?

11. How does the ratio of $2\frac{1}{2}$ to 10 compare with the ratio of $4\frac{1}{2}$ to 36?

12. The ratio of 15 to 3 is in what relation to the ratio of 90 to 9?

13. In what relation to the ratio of 6 to 24 is the ratio of 9 to 18?

14. In what relation to the ratio of 8 to 40 is the ratio of 9 to 45?

NOTE. — The expression of the equality of two ratios is called *Proportion*. The expression, "The ratio of 5 to 10 equals the ratio of 6 to 12" is written as follows: $5 : 10 = 6 : 12$.

15. The ratio of 3 to 15 is equal to the ratio of 5 to what number?

LESSON XVI.

NOTE. — It should be borne in mind that in every proportion the ratios are equal to each other.

COROLLARY. — The product of the 1st and 4th terms is equal to the product of the 2d and 3d terms.

1. Read the relation which the ratio of 5 to 20 is to the ratio of 8 to 32.

Ans. The ratio of 5 to 20 is equal to the ratio of 8 to 32.

2. Read the relation which the ratio of 6 to 24 is to the ratio of 12 to 48.

3. Read the relation which the ratio of 4 to 20 is to the ratio of 9 to 45.

4. Read the relation which the ratio of 5 to 40 is to the ratio of 9 to 45.

5. Read the relation which the ratio of 4 to 24 is to the ratio of 6 to 42.

6. Read the relation which the ratio of 9 to 54 is to the ratio of 8 to 72.

7. Construct and read a proportion, using the numbers 3, 7, 9, 21.

8. Construct and read a proportion, using \$4, 3 feet, 9 feet, and \$12.

9. Construct and read a proportion, using 5 miles, 8 days, 64 days, and 40 miles.

10. Construct and read a proportion, using 6 acres, 9 hours, 42 acres, and 63 hours.

11. Construct and read a proportion, with 10 cords, 12 years, 84 years, and 70 cords.

12. Construct and read a proportion, using 9 bushels, 24 months, 3 bushels, and 8 months.

13. Construct and read a proportion, using 7 yards, \$12, 56 yards, and \$96.

14. Construct and read a proportion, using 6 quarts, 72 cents, 22 quarts, and \$2.64.

LESSON XVII.

1. What is the cost of 4 tons of coal, if 12 tons cost \$90?

SUGGESTION. — The ratio of 4 tons to 12 tons equals the ratio of \$? to \$90.

2. If 8 cords of wood cost \$54, at the same rate, what is the cost of 4 cords?

3. If 4 men can earn \$50 in a given time, how much in the same time can be earned by 12 men?

4. How many acres of grass can be cut by 20 men, if 12 acres can be cut by 5 men in the same time?

5. If a staff 8 feet high casts a shadow 25 feet long, how high is a pole which, at the same time, casts a shadow 75 feet long?

6. How high is a staff which casts a shadow 20 feet long, if a pole 32 feet high at the same time casts a shadow 80 feet long?

7. A and B are in business. A, having in it a capital of \$3200, takes as his share of the profit \$400. What are B's profits, with a capital of \$2000?

8. If 12 horses consume 150 bushels of oats in a given time, how many bushels are consumed by 8 of the horses?

9. A lot 12 rods long and 5 rods wide costs \$8000. What is the cost of a similar lot 4 rods long and 3 rods wide?

10. A lot 10 rods long and 5 rods wide costs \$1000. What is the width of a similar lot 8 rods long, whose value is \$8000?

11. How long is a lot 6 rods wide, worth \$6000, if a similar lot 12 rods long and 5 rods wide is worth \$7500?

12. How many bushels of corn can be bought for \$30, if $4\frac{1}{2}$ bushels can be bought for \$2.50?

13. If $\frac{1}{4}$ of a barrel of flour can be bought for \$3 $\frac{1}{4}$, how many barrels can be bought for \$37 $\frac{1}{2}$?

LESSON XVIII.

1. If 6 men in 2 days can cut 25 acres of grass, how many acres can 4 men cut in 3 days?
2. How much can 4 men earn in 5 days, if 3 men in 8 days can earn \$48?
3. How many cords of wood can 5 men cut in 8 days, if 10 men in 12 days can cut 72 cords?
4. If a man can walk 200 miles in 6 days of 8 hours each, how far can he walk in 12 days of 6 hours each?
5. How many men in 5 days can dig 16 rods of ditch, if 6 men in 15 days can dig 96 rods?
6. If 12 men in 6 days can plow 75 acres of land, how many men in 9 days can do the same work?
7. In how many days can 10 horses consume 35 bushels of oats, if 6 horses can consume 42 bushels in 12 days?
8. If the interest of \$20 for 9 months is \$1.20, what is the interest of \$50 for 1 year 3 months?
9. What are the wages of 25 men for 8 days, if the wages of 15 men for 5 days are \$180?
10. If 5 men in 18 days can build 45 rods of wall, how many rods of wall can 6 men build in 10 days?
11. How many gallons of water can be discharged by 9 pipes in 8 hours, if 1200 gallons can be discharged by 8 similar pipes in 12 hours?
12. If a man can travel 128 miles in 6 days of 8 hours each, how far can he travel in 9 days of 6 hours each?
13. If the interest of \$50 for 7 months is \$4.20, what is the interest of \$120 for 15 months?
14. If 6 men can do a piece of work in 12 days, in how many days can 8 men do a piece of work 3 times as large?
15. A marble slab 10 feet long and 6 feet wide weighs 5500 pounds. What is the width of a slab 9 feet long that weighs 6600 pounds?

LESSON XIX.

1. Two men bought a piece of land, each paying \$ 150. How much of the land belongs to each man? Why?

2. Three men hire a pasture, each man paying \$ 12. How much of the pasture is each man entitled to? Why?

3. If 2 men engage in business, each putting in a capital of \$ 2000, what is the respective interest of each in the business? Why?

4. If 3 men are in partnership, each with a capital of \$ 2500, how much of the profits should each receive? Why?

5. If 4 men engage in a business, putting in a capital of \$ 3000 each, what part of the losses should each man sustain?

6. If 2 men form a business partnership, one putting in \$ 600, and the other \$ 1200, what is each one's share of the total capital?

7. If A contributes $\frac{1}{3}$ of a business capital, and B the remainder, how much of the losses should each one sustain? Why?

8. B contributes 20% of a business capital and C 35% of it. How much of the gains should each one receive?

9. G contributes 35% of the capital to a business, and H 45% of it. How much of the gains should each receive?

10. If 2 men engage in business, one putting in \$ 600, and the other \$ 1200, how much of the profits should each receive?

11. How much of the losses should each one sustain, if 3 men contribute, respectively, \$ 500, \$ 1000, and \$ 1500 to the capital of a business?

12. How much of the profits of a business should each one receive if 2 men contribute, respectively, \$ 800 and \$ 1200 to the capital?

LESSON XX.

1. A contributed $\frac{5}{12}$ and B $\frac{7}{12}$ of a business capital. If their profits are \$240, what is each one's share?

2. If, in a business partnership, one pays in $\frac{3}{8}$ of the capital, and another pays in $\frac{3}{8}$ of it, what is each one's share of a profit of \$1200?

3. If 3 men contribute, respectively, $\frac{3}{8}$, $\frac{3}{8}$, and the remainder of a business capital, what is each one's share of a profit of \$200?

4. If 3 men contributed, respectively, \$300, \$400, and \$500, what part of the capital did each one contribute? How much of the profits should each one receive? Why?

5. Three men hire a pasture for \$63. If one puts in 2 cows, the second 3 cows, and the third 4 cows, how much of the rental should each pay?

6. Three men engage in business, paying in \$2000, \$3000, and \$4000, respectively. Their gains are \$1800. How much is each one's share of the profits?

7. If 2 men engage in business, one putting in \$2700, and the other \$4500, what is each one's share of a profit of \$1680?

8. What is each man's share of a profit of \$300, if 3 men contribute, respectively, $\frac{1}{3}$, $\frac{2}{3}$, and the remainder of the capital of a business?

9. A, B, and C owned, respectively, $\frac{1}{3}$, $\frac{5}{8}$, and the remainder of a property, which was sold for \$800. What was each one's share of the sale?

10. Three men contributed, respectively, \$200, \$250, and \$300 to a speculation, in which their profits were \$150. What was each one's share?

11. Two men contributed, respectively, \$400 and \$450 to a business in which the gains equaled 20% of the capital. How much of the gains should each receive?

LESSON XXI.

1. A contributes to a business \$3 as often as B contributes \$4. What is each one's share of the profit of \$210?

2. B contributes to a business \$4 as often as C contributes \$5. What is each one's share of the gain of \$360?

3. If one man invests \$5 in a business as often as another invests \$7, what is each one's share of the gain of \$480?

4. If one man invests \$8 in a business as often as another invests \$12, what is each one's share of the gain of \$450?

5. One man's share of the gain in a business is \$240, and his partner's share is \$360. The whole gain equals 20% of their capital. How much did each contribute?

6. A's gain in business is \$350, and B's is \$450. The gain equals 25% of their capital. What is each one's capital?

7. In the distribution of profits, C receives \$6 as often as D receives \$9. What is each one's share of a capital of \$5500?

8. G gets \$6 of the profits of a business as often as H gets \$12. What is each one's share of a capital of \$6000?

9. A man gets \$9 of the profits in a business as often as his partner gets \$15. What is each one's share of a capital of \$7200?

10. A contributes to a business \$2, and B \$3, as often as C contributes \$4. What is each one's share of a profit of \$81?

11. B contributes to a business \$3, and C \$4, as often as D \$5. What is each one's share of a loss of \$84?

LESSON XXII.

1. What is the ratio of a man's wages for 2 days to his wages for 1 day?

2. How does the rental of a house for 3 months compare with the rental of the same house for 1 month?

3. How does the fare for riding 5 miles compare with the fare for riding 10 miles?

4. In what ratio to the interest of money for 6 months is the interest of the same money for 2 months? For 3 months?

5. In what ratio to the interest of \$ 200 for 5 months is the interest of \$ 200 for 1 month?

6. How does the interest of \$ 10 for 4 months compare with the interest of \$ 10 for 2 months?

7. How does the interest of \$ 20 for 6 months compare with the interest of \$ 40 for 6 months?

8. In what ratio to the interest of \$ 40 for 5 months is the interest of \$ 20 for 10 months?

9. In what ratio to the interest of money for a given time is the interest of twice the money for one-half the time?

10. How does the interest of money for 2 months compare with the interest of twice the sum for 1 month?

11. In what ratio to the interest of \$ 50 for 3 months is the interest of \$ 150 for 1 month?

12. How does the interest of \$ 20 for 5 months compare with the interest of \$ 100 for 1 month?

13. In what ratio to the interest of \$ 30 for 4 months is the interest of \$ 120 for 1 month?

14. How does the interest of \$ 50 for 4 months compare with the interest of \$ 80 for 5 months?

15. In what ratio to the interest of \$ 60 for 4 months is the interest of \$ 240 for 1 month?

LESSON XXIII.

1. If A contributes to a business \$ 200 for 1 year, and B \$ 200 for 6 months, in what ratio is B's share of the profits to A's? Why?

2. If C contributes to a business \$ 200 for 1 year, and D \$ 400 for 1 year, how does C's share of the profits compare with D's?

3. If E puts into trade \$ 500 for 2 years, and F \$ 1000 for 1 year, in what ratio are their shares of the profits?

4. If one man puts into a business \$ 300 for 4 months, and another \$ 400 for 3 months, how do their shares of the profits compare?

5. In what ratio are the profits of two men, one of whom puts into a business \$ 900 for 4 months, and the other \$ 1200 for 3 months?

6. In what ratio are the profits of two men, one of whom puts into a business \$ 500 for 4 months, and the other \$ 2000 for 1 month?

7. In what ratio to B's profits are A's, if the former puts into a business \$ 300 for 1 year, and the latter \$ 200 for 1 year?

8. If one man puts into a business \$ 2000 for 5 months, and another \$ 5000 for 2 months, how do their shares of the profits compare?

9. One man put into a business \$ 3000 for 8 months, and another \$ 4000 for 9 months. How do their shares of the profits compare?

10. The use of \$ 50 for 4 months is equivalent to the use of how many dollars for 1 month?

11. The use of \$ 60 for 5 months is equivalent to the use of how many dollars for 1 month?

12. The use of \$ 400 for 1 month is equivalent to the use of \$ 50 for how many months?

LESSON XXIV.

1. A and B hired a pasture for \$24, into which A put 3 cows for 4 weeks, and B 4 cows for 5 weeks. How much of the rental should each pay?

ANALYSIS. — The pasture of 3 cows for 4 weeks is equivalent to the pasture of 12 cows for 1 week; the pasture of 4 cows for 5 weeks, to the pasture of 20 cows for 1 week; the pasture of all the cows is equivalent to the pasture of 32 cows for 1 week. A's share would, therefore, be $\frac{12}{32}$, or $\frac{3}{8}$ of the rental, and $\frac{3}{8}$ of \$24 equals \$9. Find B's share.

2. A put into a business \$300 for 8 months, and B \$400 for 9 months. What was each one's share of a profit of \$1000?

3. C put into trade \$500 for 8 months, and D \$600 for 10 months. What is each one's share of a gain of \$200?

4. One man put into a business \$500 for 12 months, and his partner \$600 for 8 months. What is each one's share of a gain of \$270?

5. G put into a business \$500 for 9 months, and H \$600 for 5 months. How much is each one's share of a gain of \$350?

6. One man put into business \$300 for 8 months, and another \$1000 for 3 months. What is each one's share of a profit of \$360?

7. A put into trade \$6000 for 1 year. After 3 months B put in \$8000. How much of the yearly profit of \$1320 should each receive?

8. C put into trade \$5000 for 1 year. After 4 months D put in \$9000. How much of the profit of \$1210 should each one receive?

9. If a capital of \$4000 yields \$180 in 6 months, how much capital would yield \$180 in 8 months?

10. A put into trade \$3000 for 6 months, and his gain is \$720. How much should B put in for 6 months so that his profit shall be \$540?

LESSON XXV.

1. If 35 marbles are divided between two boys, so that one gets 3 as often as the other gets 4, how many does each receive?

2. If 2 men are paid \$40, so that one gets \$3 as often as the other gets \$5, how much does each man get?

3. Two men were paid \$45, one getting \$4 as often as the other received \$5. How much did each man receive?

4. A man and a boy earned \$50, the boy earning \$3 while the man earned \$7. How much did each earn?

5. James and Henry earn \$60, James earning \$2½ while Henry earns \$3½. How much does each earn?

6. A and B together own \$72. A owns \$5 to B's \$7. How much does each man own?

7. Two men can cut 60 acres of grass, one cutting ½ of an acre while the other cuts ¾ of an acre. How many acres can each man cut?

8. Two men rent a pasture for \$48, one having in it 5 cows, and the other 7 cows. How much of the rental should each man pay?

9. Two men together labored 48 days, one laboring 3½ days as often as the other labored 4½ days. How many days did each labor?

10. A cord 45 feet long is cut so that the shorter piece is as many times 3½ feet as the longer is times 5½ feet. How long is each piece?

11. A and B paid \$102 for a wagon, A paying \$¾ as often as B paid \$¾. How much of the cost did each pay?

12. Two men rented a meadow for \$30, one man paying \$2¾ for every \$3½ that the other paid. How much did each man pay?

13. If 45 peaches were divided among three girls in the ratio of 2, 3, and 4, how many peaches did each girl receive?

LESSON XXVI.

1. B and C were paid \$12, B receiving $\frac{1}{2}$ as much as C. How much money did each receive?

2. E's age is twice D's age, and the sum of their ages is 24 years. How old is each?

3. If \$25 was divided between a man and a boy, so that the boy received $\frac{2}{3}$ as much as the man, how much did each receive?

4. Two men are together paid \$32, one receiving $\frac{3}{4}$ as much as the other. How much money does each receive?

5. If \$50 was divided between two men, one getting $\frac{3}{4}$ times as much as the other, how much did each man get?

6. In a certain school, the number of girls equals $1\frac{1}{2}$ times the number of boys. How many of each are there, if there are 48 pupils?

7. A put into a bank $2\frac{1}{2}$ times as much money as B. They both put in \$55. How much did each one put in?

8. If \$126 was paid for a horse and saddle, the saddle being worth $\frac{1}{8}$ as much as the horse, how much was paid for each?

9. A man and a boy earned \$100, the man earning $2\frac{1}{2}$ times as much as the boy. How much did each earn?

10. If 99 sheep were put into two fields, $\frac{4}{5}$ as many being put into one as into the other, how many were put into each field?

11. B, C, and D together earn \$120, C earning twice as much as B, and D twice as much as C. How much does each one earn?

12. G and H invested \$480, H investing $1\frac{1}{2}$ as much as G. How much did each invest?

13. If \$42 is divided among 3 persons, the first being given twice as much as the second, and the second 3 times as much as the third, how much is given to each?

LESSON XXVII.

1. If a man can do a piece of work in 6 days, how much of it can he do in one day?

2. How much of a vessel can be filled in one hour, if it can be filled in 7 hours?

3. A quantity of provisions is eaten by a family in 8 weeks. How much of it is eaten in one week?

4. If a journey can be performed in 9 days, how much of it can be performed in 1 day?

5. In 6 days, A can do a piece of work which B can do in 7 days. How much of it can each man do in one day?

6. In 7 days B can mow a field of grass which C can mow in 8 days. How much can both mow in one day?

7. In 8 days G can cut a field of grain, which H can cut in 9 days. How much of it can both cut in one day?

8. If a man can do a piece of work in 9 days, and his son can do it in 10 days, how much of it can both do in one day?

9. If $\frac{5}{12}$ of a piece of work can be done in one day, in what time can the work be done?

10. If $\frac{1}{3}$ and $\frac{1}{5}$ of a wall can be built in one day, in what time can the wall be built?

11. In 6 days, one man can build a bridge which another man can build in 8 days. In what time can both build it?

12. If one man can build a wall in 6 days, and another can build it in 9 days, in what time can both build it?

13. B can dig a trench in 8 days, which C can dig in 10 days. In what time can both dig it?

14. C can build a fence in 6 days, which D can build in 12 days. In what time can both build a fence $\frac{1}{3}$ as long?

15. G can build a wall in 8 days, which H can build in 12 days. In what time can both build a wall 3 times as long?

LESSON XXVIII.

1. If A can do a piece of work in 6 days, and B in 8 days, how much more than B can A do in one day?

2. In 6 days, A and B can do a piece of work which A can do in 9 days. How much less than both can A do in one day?

3. B and C can build a boat in 12 days, which B can build in 20 days. How much of it can C build in one day?

4. In 9 hours, 2 pipes can empty a vessel which one of them can empty in 15 hours. In what time can the other pipe empty it?

5. In 6 days, a man and his son can dig a trench, which the son can dig in 24 days. In what time can the man dig it?

6. In 6 days, A and B can do a piece of work, which B can do in 10 days. In what time can A do the work?

7. In 5 months, two men can build a wall which one of them can build in 12 months. In what time can the other build it?

8. A quantity of provisions was eaten by C and D in 12 days, which C could have eaten in 20 days. In what time could D have eaten it?

9. John can do a piece of work in $2\frac{1}{2}$ hours, which he and James can do in $1\frac{1}{3}$ hours. In what time can James do it?

10. Henry can build a fence in $7\frac{1}{2}$ days, which he and George can build in $3\frac{1}{3}$ days. In what time can George build it?

11. Robert can dig a ditch in $8\frac{2}{3}$ days, which he and William can dig in $5\frac{3}{4}$ days. In what time can William dig it?

12. B and C could have done a piece of work in 12 days, but B left in 6 days, and C did the remainder in 12 days. In what time could each alone have done the work?

LESSON XXIX.

1. If a man can do a piece of work in $\frac{1}{2}$ of a day, how much work can he do in one day?

2. If A can do a piece of work in $\frac{1}{2}$ of a day, and B in $\frac{1}{3}$ of a day, how much work can each do in one day?

3. If C can build a wall in $\frac{1}{3}$ of a day, and D in $\frac{1}{4}$ of a day, how much wall can both build in one day?

4. If Henry can do 3 times a piece of work in one day, in what time can he do the work?

5. In one day, one man can do 4 times a piece of work, and another 5 times. In what time can each do the work?

6. If in one day B can do 3 times a piece of work, and C 5 times, in what time can both do the work?

7. E can do a piece of work in $\frac{1}{3}$ of a day, and F can do it in $\frac{1}{4}$ of a day. In what time can both men do the work?

8. If A can build a fence in $\frac{1}{4}$ of a day, and B can build it in $\frac{1}{5}$ of a day, in what time can both build it?

9. If G can build a wall in $\frac{2}{3}$ of a day, and H in $\frac{3}{4}$ of a day, in what time can both build the wall?

10. George can dig a trench in $\frac{3}{4}$ of a day, and Joe in $\frac{2}{3}$ of a day. In what time can both dig it?

11. John can cut a field of grass in $\frac{3}{4}$ of a day, and James in $\frac{2}{3}$ of a day. In what time can both cut it?

12. If A and B can do a piece of work in $\frac{1}{2}$ day, and A can do it in $\frac{2}{3}$ day, in what time can B do it?

13. B and C can build a fence in $\frac{1}{3}$ of a day, and B in $\frac{1}{4}$ of a day. In what time can C build it?

14. D and E can do a piece of work in $\frac{1}{2}$ of a day, and D in $\frac{5}{12}$ of a day. In what time can E do the work?

15. A can do a piece of work in $\frac{1}{2}$ of a day, B in $\frac{2}{3}$ of a day, and C in $\frac{3}{4}$ of a day. In what time can all do it?

16. C and D can dig a cellar in $7\frac{1}{2}$ days, which C can dig in 12 days. In what time can D dig it?

LESSON XXX.

1. To A, B, and C \$ 63 was paid, so that B got $\frac{1}{2}$ and C $\frac{2}{3}$ as much as A. How much money did each receive?

2. Divide \$ 51 into three parts, so that the second part shall equal $\frac{2}{3}$ and the third part $\frac{1}{3}$ of the first part.

3. Divide 138 chestnuts among three boys, so that the second shall receive $\frac{2}{3}$ and the third $\frac{1}{3}$ as many as the first.

4. B, C, and D together earned \$ 128, B earning $\frac{2}{3}$ as much as C, and C $\frac{3}{2}$ as much as D. How much did each one earn?

5. A, B, and C rent a store for \$ 158, A paying $\frac{5}{8}$ as much as B, and B $\frac{2}{3}$ as much as C. How much does each one pay?

6. F, G, and H have \$ 52. G has 4 times as much as H, and F twice as much as G. How much has each?

7. B, C, and D spend \$ 56, C spending 4 times as much as D, and B $\frac{1}{2}$ as much as C. How much did each spend?

8. C, D, and E gathered 100 quarts of nuts; E gathered $\frac{4}{5}$, and D $\frac{7}{10}$ as many as C. How many quarts did each gather?

9. D, E, and F dug 108 bushels of potatoes; D dug twice as many as E, and E 3 times as many as F. How many bushels did each dig?

10. G is 3 times as old as H, and F 4 times as old as G; the sum of their ages is 96 years. How old is each?

11. James earns 5 times as much as John, and Robert $\frac{2}{3}$ as much as James, and they all earn \$ 99 a week. How much does each earn?

12. Sarah spent 4 times as much as Ann, and Mary $\frac{3}{4}$ as much as Sarah; they all spent \$ 56. How much did each spend?

13. A's gains in trade are 6 times as much as B's, and C's are $\frac{2}{3}$ as much as A's. How much is each one's share of a gain of \$ 132?

LESSON XXXI.

1. If \$91 is divided between G and H so that $\frac{5}{8}$ of G's share equals H's, how much does each one get?

2. Distribute \$36 between two men so that the amount given to the first equals $\frac{4}{5}$ of the amount given to the second.

3. A and B together were given \$90, so that $\frac{3}{7}$ of A's share was equal to B's. How much did each one get?

4. If $\frac{5}{7}$ of B's money is equal to C's, and they both have \$60, how much money has each?

5. If $\frac{3}{5}$ of C's age is equal to D's age, and the sum of their ages is 85 years, how old is each?

6. If $\frac{7}{11}$ of D's weight is equal to E's weight, and both weigh 180 pounds, how much does each weigh?

7. If $\frac{1}{2}$ of the time past noon equals the time to midnight, what o'clock is it?

8. If $\frac{7}{8}$ of A's earnings are equal to B's, and they both earn \$90, how much does each earn?

9. If $\frac{5}{8}$ of B's loss in trade equals C's, and they both lose \$132, how much does each lose?

10. If $\frac{3}{4}$ of D's money equals E's, and $\frac{5}{12}$ of their money is \$35, how much money has each?

11. If $\frac{4}{5}$ of E's money equals G's, and $\frac{7}{8}$ of their money is \$84, how much money has each?

12. H's money equals $2\frac{1}{2}$ times E's, and $\frac{1}{5}$ of this money is \$144. How much has each?

13. Henry's land equals $2\frac{3}{4}$ as much as John's, and $\frac{2}{11}$ of their land is 77 acres. How much land has each?

14. Scott owns $3\frac{1}{2}$ times as many cattle as Smith, and $\frac{1}{4}$ the number that both own is 26. How many cattle does each own?

15. If $\frac{3}{7}$ of Bruce's land, plus 8 acres, equals Sabin's, and both own 108 acres, how much land does each own?

LESSON XXXII.

1. If $\frac{1}{2}$ of A's land equals $\frac{2}{3}$ of B's, and they both have 84 acres, how many acres has each?
2. If $\frac{1}{2}$ of B's money equals $\frac{3}{4}$ of C's, and they both have \$120, how much money has each?
3. If $\frac{2}{3}$ of A's age equals $\frac{3}{4}$ of B's, and the sum of their ages is 85 years, how old is each?
4. If $\frac{2}{3}$ of B's gains in trade equals $\frac{3}{4}$ of C's, and their gains are \$95, what is the gain of each?
5. If $\frac{2}{3}$ of the part of a pole broken off equals $\frac{3}{4}$ of the part left standing, how long is each part if the pole was 60 feet in height?
6. If $\frac{2}{3}$ of G's land equals $\frac{3}{4}$ of C's, and both own 144 acres, how much does each own?
7. If $\frac{2}{3}$ of Mr. A's wheat equals $\frac{3}{4}$ of his oats, and he has 99 bushels of both, how many bushels of each has he?
8. If $\frac{2}{3}$ of the length of a pole equals $\frac{3}{4}$ of its shadow, and the length of both is 66 feet, how long is the pole?
9. If $\frac{2}{3}$ of the cost of a cow equals $\frac{3}{4}$ of the cost of a horse, and they both cost \$132, what is the cost of each?
10. If $\frac{2}{3}$ of B's gains in trade equals $\frac{3}{4}$ of C's gains, and they both gain \$96, what is the gain of each?
11. In an orchard, $\frac{2}{3}$ of the apple trees equals $\frac{3}{4}$ of the peach trees, and there are 134 of both. How many apple and how many peach trees are there?
12. In a school of 177 pupils, $\frac{2}{3}$ of the girls equal $\frac{3}{4}$ of the boys. How many are there of each?
13. If $\frac{2}{3}$ of A's land and 8 acres equal $\frac{3}{4}$ of B's, and they both have 92 acres, how many acres has each?
14. If $\frac{2}{3}$ of B's money, less \$5, equals $\frac{3}{4}$ of C's money, and they both have \$139, how much money has each?
15. If $\frac{2}{3}$ of B's money, less \$7, equals $\frac{3}{4}$ of C's money, and they both have \$97, how much money has each?

LESSON XXXIII.

1. If the time past noon equals $\frac{1}{2}$ of the time to midnight, what is the time of day?

ANALYSIS. — Since the time past noon equals $\frac{1}{2}$ of the time to midnight, the time from noon to midnight, which is 12 hours, equals $\frac{2}{3}$ of the time to midnight, and the time past noon, which equals $\frac{1}{3}$ the time to midnight, equals $\frac{1}{3}$ of 12 hours, which is 4 hours. 4 hours past noon is 4 o'clock P.M.

2. If the time past noon equals $\frac{1}{3}$ of the time to midnight, what is the time of day?

3. If $\frac{2}{3}$ of the time past noon equals $\frac{2}{7}$ of the time to midnight, what o'clock is it?

4. If $\frac{3}{4}$ of the time past noon equals $\frac{3}{5}$ of the time to midnight, what is the time of day?

5. The time past noon equals $\frac{1}{5}$ of the time to midnight. What is the time of day?

6. If $\frac{3}{4}$ of the time past noon equals $\frac{3}{8}$ of the time to midnight, what is the time of day?

7. The time past noon equals $\frac{2}{3}$ of the time to midnight. What is the time of day?

8. The time past noon and 1 hour equals $\frac{5}{7}$ of the time to midnight. What is the time of day?

9. The time past noon and 1 hour equals $\frac{1}{3}$ of the time to midnight. What is the time of day?

10. The time past noon less 1 hour equals $\frac{2}{3}$ of the time to midnight. What is the time of day?

11. If $\frac{3}{4}$ of the time past noon equals $\frac{3}{7}$ of the time to midnight, what is the time of day?

12. If $\frac{4}{7}$ of the time past noon equals $\frac{4}{11}$ of the time to midnight, what is the time of day?

13. If $\frac{3}{8}$ of the time past noon equals $\frac{3}{8}$ of the time to midnight, what is the time of day? If it equals $\frac{4}{5}$ of the time to midnight?

LESSON XXXIV.

1. If the time past noon equals $\frac{1}{3}$ of the time past midnight, what is the time of day?

ANALYSIS. — Since the time past noon equals $\frac{1}{3}$ of the time past midnight, the time from midnight to noon, which is 12 hours, equals $\frac{2}{3}$ of the time past midnight, and the time past noon, which equals $\frac{1}{3}$ of the time past midnight, equals $\frac{1}{2}$ of 12 hours, which is 6 hours past noon, or 6 o'clock P.M.

2. What is the time of day, if the time past noon equals $\frac{1}{4}$ of the time past midnight?

3. What is the time of day, if the time past noon equals $\frac{2}{5}$ of the time past midnight?

4. What is the time of day, if the time past noon equals $\frac{3}{7}$ of the time past midnight?

5. If the time past noon equals $\frac{5}{8}$ of the time past midnight, what o'clock is it?

6. What o'clock is it, if the time past noon equals $\frac{3}{8}$ of the time past midnight?

7. What o'clock is it, if $\frac{1}{3}$ of the time past noon equals $\frac{1}{5}$ of the time past midnight?

8. What o'clock is it, if $\frac{3}{4}$ of the time past noon equals $\frac{3}{16}$ of the time past midnight?

9. What o'clock is it, if $\frac{2}{3}$ of the time past midnight equals $\frac{2}{3}$ of the time to midnight?

10. What o'clock is it, if $\frac{5}{17}$ of the time past midnight equals $\frac{5}{7}$ of the time to midnight?

11. If $\frac{1}{10}$ of the time past midnight equals $\frac{3}{5}$ of the time to midnight, what o'clock is it?

12. What o'clock is it, if $\frac{3}{5}$ of the time past midnight equals $\frac{3}{10}$ of the time to midnight?

13. If the time past noon plus 3 hours equals $\frac{2}{3}$ of the time to midnight, what o'clock is it? If it equals $\frac{1}{4}$ of the time?

LESSON XXXV.

1. James has 3 marbles more than Henry, and both have 13 marbles. How many marbles has each ?

SUGGESTION. — If Henry had 3 marbles more than he now has, how many marbles would both have ? How many would each have ? Or, if James had 3 marbles less than he now has, how many marbles would both have ? How many would each have ?

2. A and B own 18 acres of land, and A owns 2 acres more than B. How many acres has each ?

3. A man has \$6 more than his son, and they both have \$24. How much money has each ?

4. Mr. Chase's profits are \$8 more than Mr. Scott's, and the profits of both are \$40. What are the profits of each ?

5. C is 12 years older than D, and the sum of their ages is 52 years. How old is each ?

6. John's wages for the month are \$7 $\frac{1}{2}$ more than Robert's, and the wages of both are \$63.50. What are the wages of each ?

7. B's expenses for a week are \$8 less than C's, and they both expend \$49. How much does each spend ?

8. G worked 15 days less than H, and they both worked 72 days. How many days did each work ?

9. E and F rent a field for \$84, E paying \$17 less than F. How much does each one pay ?

10. William and Clarence own 96 acres of land, William owning 18 acres more than Clarence. How much does each own ?

11. A and B had an equal number of cattle. A bought 16 more, when they both had 84 cattle. How many had each ?

12. Of an equal number of sheep C sold 10, and D 15, when they had 75 sheep. How many did each have left ?

LESSON XXXVI.

1. If the gain equals $\frac{5}{8}$ of the cost, what is the gain per cent?
2. If the gain equals $\frac{3}{8}$ of the selling price, what is the gain per cent?
3. If $\frac{3}{4}$ of the gain equals $\frac{3}{10}$ of the cost, what is the gain per cent?
4. If $\frac{3}{8}$ of the loss equals $\frac{4}{25}$ of the cost, what is the loss per cent?
5. If $\frac{3}{4}$ of the gain equals $\frac{6}{25}$ of the cost, what is the gain per cent?
6. If $\frac{3}{5}$ of gain equals $\frac{4}{25}$ of cost, what is the gain per cent?
7. What is the loss per cent, if $\frac{3}{8}$ of the loss equals $\frac{3}{25}$ of the cost?
8. What is the gain per cent, if $\frac{4}{5}$ of the gain equals $\frac{4}{25}$ of the selling price?
9. What is the gain per cent, if $\frac{3}{4}$ of the gain equals $\frac{1}{4}$ of the selling price?
10. If $\frac{3}{5}$ of the loss equals $\frac{3}{20}$ of the selling price, what is the loss per cent?
11. If $\frac{3}{4}$ of the gain equals $\frac{3}{25}$ of the selling price, what is the gain per cent?
12. If $\frac{3}{8}$ of the cost equals $\frac{4}{5}$ of the selling price, what is the gain or loss per cent?
13. What is the gain or loss per cent, if $\frac{5}{8}$ of the cost equals $\frac{4}{5}$ of the selling price?
14. If the selling price equals 9 times the gain, what is the gain per cent?
15. What is the gain or loss per cent, if $\frac{3}{4}$ of the cost equals $\frac{5}{4}$ of the selling price?
16. What is the loss per cent, if the selling price equals 11 times the loss?

LESSON XXXVII.

1. A's age is 4 years. B's age equals A's and $\frac{1}{3}$ of C's, which is equal to the sum of A's and B's. How old is each?

2. B owns 6 acres, C as much as B and $\frac{1}{4}$ as much as D, who owns as much as B and C. How much does each own?

3. C travels 8 miles, D as far as C and $\frac{1}{2}$ as far as E, who travels as far as C and D. How far does each travel?

4. D earns \$9, E as much as D and $\frac{1}{3}$ as much as F, who earns as much as D and E. How much does each earn?

5. A hat cost \$5, a pair of shoes as much as the hat and $\frac{1}{3}$ as much as a coat, which cost as much as the hat and shoes. How much did each cost?

6. The head of a fish weighs 4 pounds. Its tail weighs 4 pounds and $\frac{1}{4}$ as much as the body, which weighs as much as the head and tail. What is the weight of the fish?

7. Mary gathered 10 quarts of nuts. Sarah gathered as many as Mary and $\frac{1}{3}$ as many as Harriet, who gathered as many as Mary and Sarah. How many quarts did each gather?

8. A bridle cost \$12, a saddle as much as the bridle and $\frac{2}{3}$ as much as a harness, which cost as much as the bridle and saddle. How much did each cost?

9. A is 9 years old. B is as old as A and $\frac{2}{3}$ C's age, which is equal to A's and B's. How old is each?

10. B earned \$ $\frac{1}{2}$, C as much as B and $\frac{1}{3}$ as much as D, and D as much as both. How much did each earn?

11. A girl is 8 years old; her mother's age equals the daughter's age and $\frac{1}{2}$ the father's and 10 years; the father's age equals the sum of the mother's and daughter's ages. How old is each?

12. A earns \$12. B earns as much as A and $\frac{1}{2}$ as much as C and \$20 more, and C earns as much as A and B. How much does each earn?

LESSON XXXVIII.

1. The amount of a sum of money on interest for 2 years 8 months at 6% is \$580. What is the principal?

2. A can mow a field of grass in $5\frac{1}{2}$ days, and B in $4\frac{1}{2}$ days. In what time can both mow it?

3. If 5 men can cut 100 acres of grain in 8 days, how many acres can 8 men cut in 10 days?

4. B and C can do a piece of work in $\frac{5}{8}$ of a day, and B can do $\frac{5}{8}$ of it in one day. In what time can both do the work?

5. A hat, a vest, and a coat cost \$40. The hat costs \$6, and the hat and coat cost 9 times as much as the vest. What is the cost of each?

6. At 3% commission, an agent was paid \$11.25 for selling flour at \$5 a barrel. How many barrels were sold?

7. A man sold 2 horses for \$240 each, one at a gain of 25%, and the other at a loss of 25%. How much did he gain or lose?

8. How many bushels are there in a bin if, by adding $\frac{3}{4}$ as much and $5\frac{1}{2}$ bushels, there will be 65 bushels?

9. A and B lost \$140 in such ratio that $\frac{7}{8}$ of A's loss plus \$5 was equal to B's loss. How much did each lose?

10. At $1\frac{3}{4}\%$ insurance, \$42 was paid for insuring household goods. How much was the insurance?

11. If \$69 interest was paid for the use of A's and B's money for 90 days, at 6%, how much money had each on interest, provided $\frac{2}{3}$ of A's money equaled $\frac{3}{4}$ of B's?

12. G and H rented a pasture for \$51, G paying $\$ \frac{2}{3}$ as often as H paid $\$ \frac{3}{4}$. How much of the rent did each pay?

13. What o'clock is it, if the time past noon equals $\frac{3}{4}$ of the time past midnight?

14. At $\frac{5}{8}\%$ premium, how much more is the cost of a draft of \$200 than at $\frac{1}{8}\%$ discount?

LESSON XXXIX.

1. A can do a piece of work in $\frac{4}{5}$ of a day, and B can do it in $\frac{3}{4}$ of a day. In what time can both do the work?

2. B and C engage in trade. A put in \$300 for 5 months, and B \$400 for 6 months. How much is each one's share of a gain of \$260?

3. If 12 horses can be pastured on 8 acres for 8 months, how long can 6 horses be pastured on 9 acres?

4. One pipe can fill a cistern in $3\frac{3}{4}$ hours, another can empty it in $4\frac{1}{2}$ hours. If both pipes are open, in what time will the cistern fill?

5. If 6 men and 6 boys can do a piece of work in 9 days, in what time can 9 men and 9 boys do the work, if a boy does $\frac{2}{3}$ as much as a man?

6. If 12 barrels of flour were bought for \$60, and 10 barrels were sold for what 12 barrels cost, what was the gain per cent?

7. Two horses were sold for \$180 each, whereby 25% was gained on one, and $16\frac{2}{3}\%$ lost on the other. How much was gained or lost?

8. A, B, and C can do a piece of work in 4 days, A and B in 6 days, and B and C in 8 days. In what time can each do the work?

9. B, C, and D earn \$88 in the ratio of $2\frac{1}{2}$, $3\frac{1}{2}$, and 5. How much does each earn?

10. If $\frac{3}{4}$ of A's profits in trade equal $\frac{3}{11}$ of B's, what are the profits of each, if the profits of both are \$180?

11. If $\frac{3}{4}$ of B's money equals $\frac{2}{15}$ of C's, and $\frac{2}{3}$ of the difference of their money is \$100, how much has each?

12. What o'clock is it, if the time past midnight equals $\frac{7}{8}$ of the time to midnight?

13. If 9 men can build a wall in 8 days, how many men in 6 days can do the same work?

LESSON XL.

1. In what ratio to the work of 8 men in 10 days is the work of 6 men in 8 days?
2. If 9 men can build a house in 20 days, in how many days can 10 men do the same work?
3. If B has \$84, and $\frac{5}{7}$ of his money equals \$12 more than $\frac{4}{5}$ of A's money, how much has A?
4. At $1\frac{1}{4}\%$, C paid \$60 for insuring a house for 4 years. What was the amount of insurance?
5. At a tax rate of $1\frac{3}{8}\%$, a gentleman paid a tax levy of \$79, of which \$2 was poll tax. What was the value of his property?
6. If $\frac{2}{3}$ of A's money equals $\frac{4}{5}$ of B's, and A's is \$14 less than B's, how much money has each?
7. If one man can do a piece of work in $1\frac{1}{2}$ days, and another can do it in $1\frac{1}{4}$ days, in what time can both men do it?
8. A earns \$4 $\frac{1}{2}$, and B as much as A plus $\frac{1}{3}$ as much as C, as often as C earns as much as A and B. If they all earn \$60, what is each one's share?
9. If $\frac{2}{3}$ of the time past midnight equals $\frac{2}{3}$ of the time to midnight, what o'clock is it?
10. An agent was paid \$360 for buying wheat at a commission of $1\frac{1}{3}\%$. At \$80 a bushel, how many bushels were bought?
11. If $\frac{4}{5}$ of the cost of goods equals $\frac{3}{5}$ of the selling price, what is the gain per cent?
12. If Cook County 7's are quoted at 108, what is the premium on five \$100 bonds? What is the annual income?
13. What is the bank discount of a note for \$240 for 60 days at 5%?
14. A puts into trade \$ $\frac{1}{2}$ for 10 days, B \$ $\frac{2}{3}$ for 12 days, as often as C puts in \$ $\frac{3}{4}$ for 16 days. They gain \$100. Find each one's share.

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